

80micro

A CWC/I PUBLICATION

the magazine for TRS-80* users

HOT HINTS For the MODEL 1000

MODEL 4 WINDOWS? Hardin Brothers Shows You How!

DOS POWER How to Get More Out of LDOS And TRSDOS 6

HUFFMAN CODE Shrink Your Files By 30 Percent!

REVIEWED:
DotWriter
Better Basic
NEWDOS/80 Utilities
Super DBM
Remote Control
Overdrive
Electric Desk



the change
nebea will pay \$65 pe
me 1,100 owners of NHBB co
stock. There are approximately 1.6
million shares outstanding. The

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professional expe.
merger.
Local interest in the sale pri
NHBB

TANDY 1000 CONFIDENTIAL



Over 50 Sure-Fire Tips for Better Computing

By DAVE ROWELL

I've covered the Tandy 1000 since it came out. I've ended up with a hodge-podge of information and advice. Some of this might be old hat to experienced users, but everyone, from the novice to the veteran, should find some useful tips.

• Your DOS's ANSI.SYS and KEYCONVRT.SYS keyboard driv-
can make the 1000 more com-

patible with some IBM soft
To install a driver, add a
CONFIG.SYS such as
VICE=ANSI.SYS."

• If answering date and
prompts when they serve
pose annoys you, build an
EXEC file without Date and
You won't see them again.

• Model III users may find
portable with the 1000's US
ment. Beware of the Basic
however. To return to Ba
your 8088 subroutine, use
FAR Return command
not RET 7 as the manual.

• Beware of leaning
against the front of your
speaker magnets are d
hind the front of the pla
haven't heard of any p
far, but you never know

• Tandy has changed
pansion boards mech
tach to the back pan
easily modify boards
the PC to fit in the 10
by either cutting 1/2 i
tab on the board fra
or by bending that tab
on an IBM serial I
works fine.

• Did you ever wan
Mate on an IBM PC,
other PC-compati
with only 10 functio
is a modification t
You need a disk-edi



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Four other "instant-on" programs let you use the Tandy 200 as your personal appointment calendar, address and phone directory and telephone auto-dialer/directory (the Tandy 200 generates tone dialing pulses, so you can use it with long-distance services). A much more powerful built-in program for communications makes it easy to access other computers by phone, as well as national information networks. Resident BASIC language lets you write your own programs, too.

Why 40 Columns Are "Bigger" than 80

Take a look at the 80-column screens on other portables, and you'll see why we chose a 16×40 -character format. Characters on 80-column displays are tiny and difficult to read. Tandy 200's flip-up liquid crystal display has 240×128 resolution for big, clear graphics and easy-to-read characters. Tandy 200 is the perfect take-along tool for word processing and spreadsheets—without eyestrain.

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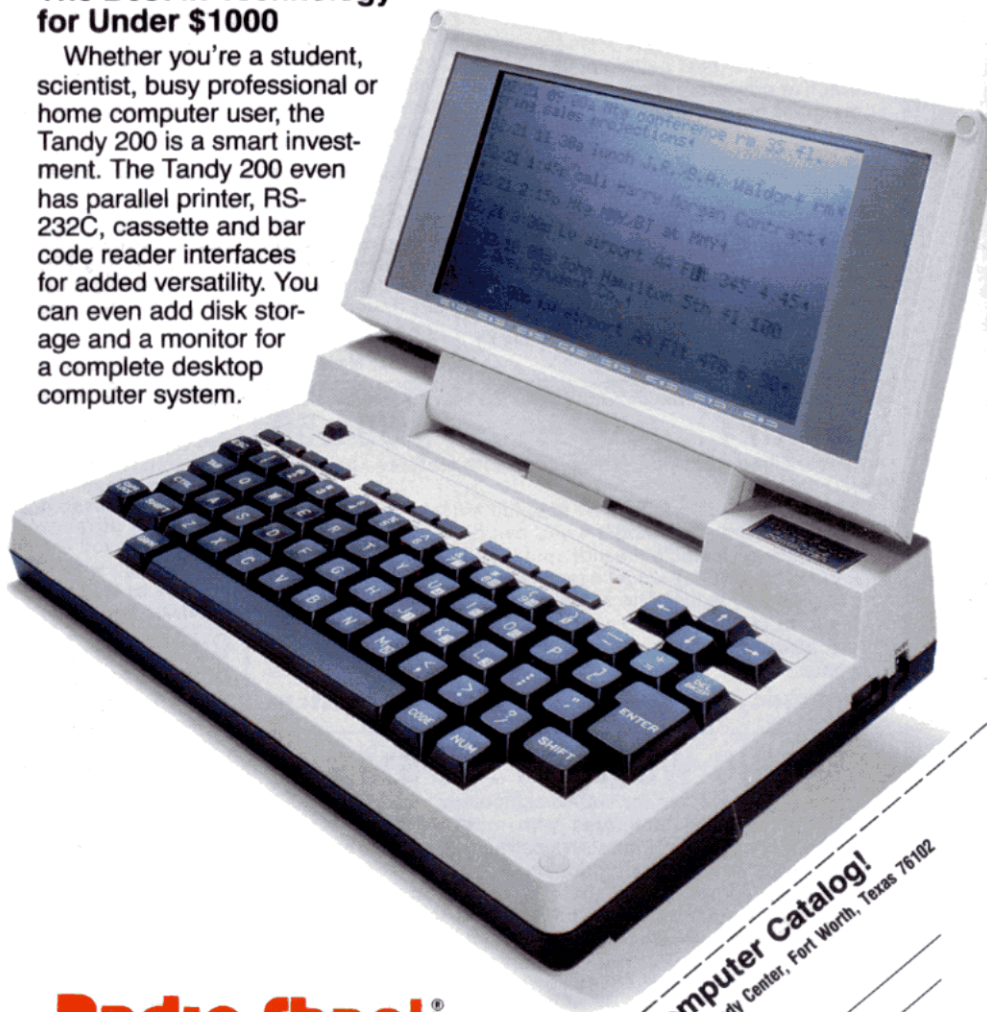
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Whether you're a student, scientist, busy professional or home computer user, the Tandy 200 is a smart investment. The Tandy 200 even has parallel printer, RS-232C, cassette and bar code reader interfaces for added versatility. You can even add disk storage and a monitor for a complete desktop computer system.

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from

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Model 3/4 only (unfortunately) \$34.50

ACCEL 3/4 Basic Compiler

This compiler from Southern Software and Allen Gelder is one of the best; it compiles almost all BASIC commands, and produces fast machine language programs.

ACCEL 3/4, Mod 1/3 Disk \$89.50

JMG has recently expanded its line with some excellent programs, and here is a run-down of the new guys on our software block:

T/MAKER

This integrated software package for the Model 4 combines word processing, spelling checking, spreadsheet, data base management, and graphics all into one package. An excellent over-all package, and a great price.

T/Maker, Mod 4 only (List \$299) \$269.50

ENBase

This is a "relational data base manager" and what that all boils down to is a very powerful program. This will handle most any data base job you can throw at it, and more.

ENBASE, Model 1 or 3 (List \$140) \$129.50

DIS'n'DATa Dissassembler

This is a dissassembler with a unique and efficient way of automatically separating data areas from machine language code. It's not 100% foolproof, but it is as close as you can get.

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Disk Drive Analyzer, Model 3/4 \$74.50

(Does what it says, list \$89/\$79)

PASCAL80 Model I/III \$69.50

PASCAL80 for CP/M \$36.50

(A well-praised Pascal Compiler)

EDIT Mod I/III from Allen Gelder \$36.50

(A full-screen editor for BASIC)

SBE from Allen Gelder \$94.50

("Mid-level language compiler"....)

VersaBusiness Series \$89.50

(AR, AP, Payroll & Inventory available)

Versalddger II \$134.50

CNVBASIC for Mod I/III or 4 \$27.50

(Powersoft's entry in the conversion club)

And there's more new stuff coming!

LESCRIPT \$94.50

Our best selling word processor, loaded with features (many not found elsewhere).

Great printer support, ease of use, full Model 4 support, and much more! On a 128K Model 4 you can have over 90K of text buffer for use on a single file (not split into multiple buffers, like other WP programs do). Model 4 features also available while running in Model III mode! The same program will run under most DOSes from TRSDOS 2.3 on a model I to DOSPLUS IV on a mod 4! And at our low price, it's the best word processing value anywhere.

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Electric Webster Model I/III or 4 (List \$149.95) \$119.50

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SAVE \$80 OFF THE LIST PRICE!!

KSoft's LOG and SUPERLOG

Very versatile "Electronic Notebook" programs that allow you to access stored information at the touch of a key, even when running other programs. Keep notes, memos, lists, or other information in the instantly accessible "pages". SUPERLOG4 for the Model 4 also contains many advanced features and commands that will make you wonder how you ever lived without the program.

LOG for Model I or III \$44.50

SUPERLOG for Mod I or III LDOS \$99.50

SUPERLOG4 for Mod 4 (List \$119.95) \$99.50

DOSPLUS 3.5 and DOSPLUS IVa

DOSPLUS is an excellent alternative to TRSDOS for Models I/III and Model 4. As they say, it's "better, faster and stronger"; in this case stronger means more powerful. Both versions come bundled with many utilities that are alone worth the price. It won't leap tall buildings in a single bound, but it will do the next best thing, which is to make life a little easier for you.

DOSPLUS 3.5 for Model I or III \$ 59.50

DOSPLUS IVa for Model 4 (List \$169.95) \$119.50

The Home Accountant \$59.50

A complete personal finance package. A thorough program; somewhat slow, but otherwise a very good package.

Home Accountant, Model III only \$59.50

TAS Public Domain Disks

These disks are a collection of quality public domain programs from all over. There's lots of stuff here, from games to utilities to applications and much more. Each disk is a "floppy" disk, and both sides are filled to the brim.

Public Domain Disk Package, #1 to #4 \$34.50

Public Domain Disk Package, #1 to #6 \$49.50

Single Disk (specify 1 to 6) \$ 9.50



THE SOURCE OF TRS-80 SOFTWARE!

IF YOU BOUGHT YOUR SOFTWARE ELSEWHERE, YOU PROBABLY PAID TOO MUCH

JMG is one of the largest sources for TRS-80 software around; we specialize in software for Models I, III and 4. Our prices are the best, and if you find a better price then we'll beat it (see below). As well, we support the programs we sell; we sell only top-quality software, and our 99% satisfaction rate speaks for itself. With the best prices, selection and support on your side, you can't lose. Model 4 owners: ALL Model 3 programs we sell will work on the Mod 4 in "III mode".

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J&M's Disk Drive Analyzer - III	(79.00)	\$ 74.50
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LONGVIEW is an "add-on" to our Dotwriter system. It includes programs and three character sizes, and runs on 48K-64K TRS-80 Models I, III, and 4/4P (native Model 4 mode). Please see our ad later in this magazine for information and pricing on Dotwriter, and the printers we support.

LONGVIEW is easy to use and comes with ready-to-run setups. First, tell VisiCalc to print your spreadsheet to disk. Next, rotate the file with **LONGVIEW**. Then, print it with Dotwriter. That's all there is to it.

LONGVIEW \$29.95
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LONGVIEW

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We have dozens of high-resolution, downloadable fonts for the Radio Shack DMP 2100P and the Epson LQ-1500. They include italics, cursive, headline, and other fancy typefaces. Each font disk includes programs to perform the download, and sample files to print them for you.

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Each disk contains at least eleven fonts and supporting programs. The disks cost \$59.95 each, and we offer substantial discounts to **ALLWRITE** owners. Please call or write to us for print samples, further information and pricing. Due to the specialized nature of this product, we recommend that you see the samples before ordering. Disk formats are available for TRS-80 I, III, 4, and MS-DOS. **ALLWRITE** is available only for TRS-80.

Information on these products is not available at our toll-free answering service, so please call or write to our Technical Support group for details:

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The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Micro*, you should make this change.

80 Micro formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of "How to Write for *80 Micro*." Payment for accepted articles is made at a rate of approximately \$50 per printed page; all rights are purchased.

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On the Cover

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by Dave Rowell

Our answer to Heloise offers helpful hints on everything from MS-DOS to DeskMate to printers. (Model 1000)

48. Extra-Strength DOS

by Keith E. Risler

Advanced DOS features in easy-to-take capsule form. (Models III and 4; Load 80)

54. Storage to Spare

by Steve Woicik

Clear your SuperScripsit disks of clutter and pack in more text files. Also—a SuperScripsit file recovery program. (Model 4; Load 80)

60. Room Available

by Stewart F. Hunter

Witness the incredible shrinking ASCII file. (Models I and III; Load 80)

Features

74. Don't Be Late

by Jack Wallace

Critical path scheduling lets you get a handle on project time-tables. (Models I, III, and 4; Load 80; Models 1000 and 2000)

82. Mutual Understanding

by Hardin Brothers

Finding points of agreement among editor/ assembler source code files.

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8. Side Tracks

by Eric Maloney

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by Terry Kepner

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NEWDOS/80 Utilities

Super DBM

Remote Control

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by Richard Ramella

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Etch-A-Mouse

TRSDOS 6.X Training Course

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edited by

Robert Mitchell

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LOAD 80

Load 80 gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on tape or disk, and runs on the Models, I, III, and 4.

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as

per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, copy the Model 4 programs from the Load 80 disk to your TRSDOS 6.X disk using the COPY command.

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly subscriptions to Load 80 are \$199.97 for disk, or \$99.97 for cassette. Individual loaders are available on disk for \$21.47 or on cassette for \$11.47, including postage. To place a subscription order, or to ask questions about your subscription, please call us toll free at 1-800-343-0728 between 9 a.m. and 5 p.m. Or, you can write to Load 80, 80 Pine St., Peterborough, NH 03458.

Directory

Setup

Article: Extra-Strength DOS (p. 48).

Systems: Model III, LDOS 5.X.X; Model 4, TRSDOS 6.X.X.

This JCL file adds additional features to your LDOS 5.X.X/ TRSDOS 6.X.X system disks. Cassette filespec: SETUP/JCL. Disk filespec: SETUP/JCL.

Repair

Article: Full Recovery (sidebar to "Storage to Spare," p. 54) (p.57). System: Model 4, 128K RAM, SuperScripsit.

A file-recovery program for Model 4 SuperScripsit. Cassette filespec: B. Disk filespec: REPAIR/BAS.

Compress

Article: Room Available (p. 60). Systems: Models I and III, 32K RAM, editor/assembler, Scripsit. Language: Assembly.

Conserve disk space by saving your files in Huffman format. Cassette filespec: COMPRS, DCOMPR. Disk filespec: COMPRS/SCR (source code), COMPRS/CMD (object code), DCOMPR/SRC (source code), DCOMPR/CMD (object code).

CPS

Article: Don't Be Late (p. 74). Systems: Models I, III and 4, 32K RAM, printer optional. Language: Disk Basic.

Develop timelines for important projects. Cassette filespec: C. Disk filespec: CPS/BAS.

Driver

Article: The Next Step (p. 102). System: Model 4, 64K RAM, TRSDOS 6.2, ALDS editor/assembler.

Languages: Assembly, Basic.

Add windowing capability to your Model 4.

Cassette filespec: DRIVER, D. Disk filespec: DRIVER/SRC (source code), DRIVER/CMD (object code), DRIVETST/BAS.

Documenter

Article: Spreadsheet Beat (p. 110).

System: Model 4, 64K RAM, Multiplan 1.06.

Language: Basic.

Print SYLK files in an easy-to-read format.

Cassette filespec: E. Disk filespec: MULTPLAN/BAS.

Convert2

Article: Special to Load 80. System: Model III, 32K RAM. Language: Disk Basic.

Convert Assembly-language source files from one assembler to another.

Cassette filespec: F. Disk filespec: CONVERT2/BAS.

TapeDisk, the Special Bonus program on the April 1985 Load 80, contains an error that prevents it from running properly. We inadvertently omitted the last two Basic statements in line 530. To make the program run, add the following to line 530:

:COMD\$(C) = "L":C = C + 1

We apologize for the error.—Eds.

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Notes From A Model 4 Watcher

Last summer, the Model 4 was on the brink of death. The people at Tandy were excited about the Model 1000, which seemed destined to replace its 8-bit older brother. The two units were simply too close in price to share a market—why would anyone pay for an obsolete 8-bit computer when, for just a bit more, they could get an MS-DOS operating system and IBM compatibility?

I was pretty depressed about the Model 4's future back then, and in several editorials predicted the demise of the computer.

But then the 4 found new life. Tandy officials, who had been harumphing and coughing into their hands when asked about the 4's future, made bold public commitments to the machine. Sales, by all accounts, improved significantly, and Radio Shack stores seemed to be moving 4's faster than batteries.

What gave the Model 4 its reprieve was its dramatic drop in price, from \$1,999 originally to as low as \$999 around Christmas. For a thousand bucks, you could get a plug-in-and-use microcomputer. The 4's price-performance ratio was hard to beat.

Looking Forward

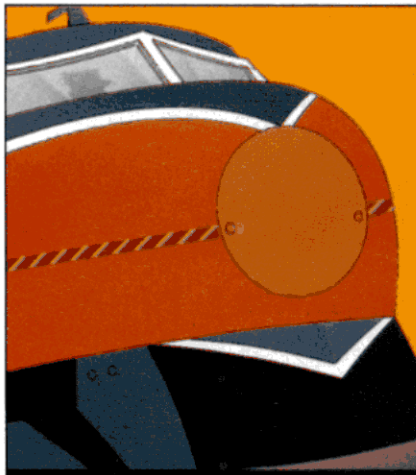
Now the question is where Tandy will take the Model 4 from here. The company has kept the machine moving by cutting its price, and could possibly do so again. But there's another way to go: Tandy could make the 4 a better machine.

With some exceptions, the Model 4 today is the same one Tandy introduced in June 1983. The green screen is its most significant change, and the only one that could truly be called an enhancement. The clustered arrow keys and repositioned RS-232 come more under the heading of fine tuning (although anyone who has wrestled with a null modem adapter on an original Model 4 will certainly appreciate the latter).

The New Model 4?

That leaves lots of room for improvement. Here are some possible enhancements Tandy might want to consider:

- A high-resolution graphics board. The Model 4 is a word- and number-crunching machine; its graphics, as we all know, are



miserable. You can't even produce a decent line graph. And TRS-80 arcade games long ago went the way of the brontosaurus.

The hi-res board would be a welcome feature. 80 Micro has a Model III hi-res system, and we're impressed by it. We've heard mostly good things about the Model 4 board. It gives you 640- by 240-pixel resolution, the same as the Model 1000 in hi-res mode. You also get BASICG, which we've found will easily adapt many GW-Basic programs.

The hi-res board would make the Model 4 appropriate for many new applications. The most obvious is business graphs, as evidenced by our cover story in April ("Clear-Cut Trends," p. 40). CAD-CAM programs and arcade games represent other possibilities.

As anyone with a hi-res board knows, the problem now is finding software. But you can bet that if the board was standard, the software would come.

- Extra disk storage. Tandy has three options here: more floppy disk storage with double-sided (and perhaps quad-density) drives, a hard disk, or both. In the first case, two-drive storage would increase memory from the current 360K to 720K (1.4 megabytes if the drives were quad density).

Hard disks are no longer the luxury or novelty they once were, and they're inexpensive enough to be included in computers as standard equipment. Witness the Model 1200, a \$1,999 machine with a 10-megabyte hard drive.

- A full 128K random-access memory. The extra memory isn't critical for most Model 4 applications, but Multiplan and SuperScript users will tell you how valuable the Memdisk option is in cutting down disk input/output and increasing execution speed. Tandy's DoubleDuty is another way to put the additional 64K to good use, by letting you load two independent programs and toggle between them. In fact, why not give users the 128K, and include DoubleDuty on the TRSDOS 6.X disk?

- Bundled software. Tandy has traditionally avoided bundling software (DOS and Basic excepted), although it did so for a while last year with the Model 4P.

The argument against bundled software is that the consumer doesn't necessarily get the packages he wants. The alternative is free software. The consumer has a choice of, say, three programs from a list of 10, or receives a coupon for \$300 or so worth of software.

Would a package that included, say, VisiCalc, Profile, and Scriptit help sales? How about a Model 4 version of DeskMate, the software that comes with the Model 1000? *C'est possible.*

- Bundled hardware. Why not? Tandy has already done it, earlier this year with the 2000, 1200, and 100. They called it a two-for-one sale: if you bought either of the MS-DOS machines, you got an 8K 100 for free. They could sell the Model 4 and, say, the DMP-105 printer (\$199.95 in the 1985 catalog) as a package. Or how about a free 16K Color Computer 2, a \$119.95 value?

- The first three of the above: the high-resolution board, a 10-megabyte hard drive, and 128K. Tandy could add \$500 or so to the list price and call it the Model 4 Plus, an 8-bit version of the Fat Mac or IBM PC XT.

Some of these enhancements are more the result of wishful thinking than of pragmatic analysis. In any case, the point is that Fort Worth must continue to modify and improve the Model 4 if Tandy wants the system to remain a viable product.

Consumers always like more value for their money. Otherwise, they go looking elsewhere, as Tandy has already learned the hard way. ■

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If you want to create your own logos, modify our typefaces, or even design entirely new typefaces, then you will also want to order the "Letter-set Design System" (LDS). We offer LDS at half-price when you order it along with DOTWRITER. LDS operates in Model III mode on the Model 4.

Versions are available for Epson MX-80 with Grafrax, MX-100 with Grafrax-Plus, RX-80, FX-80, C. ITOH 8510/1550, Microline 84/92/93; Radio Shack's DMP series 200-2100, CGP-220 & Gemini 10X, 15X. Please specify printer and computer!

Our print samples were done on an Epson. Sizes vary on other printers. Some of the samples shown here are taken from the additional Letterset disks.

Two disk drives and at least 48K of memory are required. LDS is not available in native Model 4 mode.



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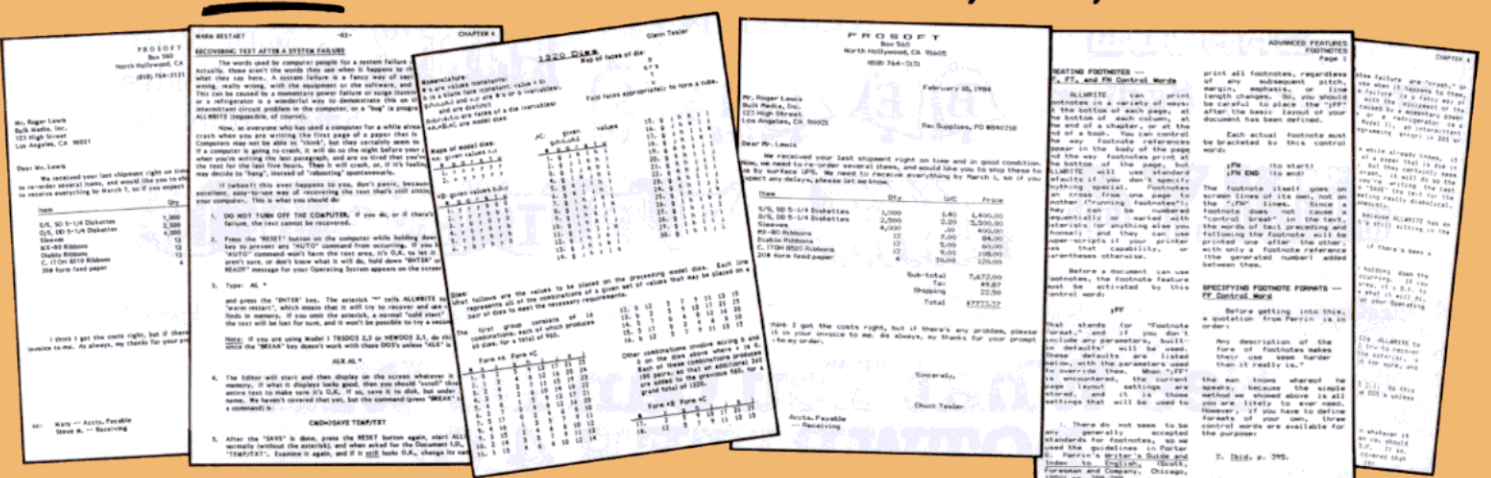
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ALLWRITE is based on the proven methods that made NEWSWRITE the most popular independently produced TRS-80 word processor, but it also has the speed and new features our customers have asked us for. ALLWRITE will save you time and let you produce the highest-quality, most professional-looking letters, term papers, and reports available on a micro-computer.

Allwrite Can Save You Time!

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ALLWRITE'S Screen Handling Makes Word Processing Easier Than Ever

Change text width at any time; wide lines shift left and right as you type. ALLWRITE preserves double-blanks between sentences, uses the entire screen for text, and displays a complete Status Screen at the touch of a key. Scroll by line, partial screen, full screen, to top or end of file, or to any marked point. Move cursor by character, word, tab, line, or screen.

You can set and change on-screen tabs and store them on disk. The print-time tabbing features are incredibly versatile: they allow left, right, and centered tabs, and even line up your decimal points.

ALLWRITE shows you where you forgot to turn off underlining, boldface, or double-width. Special on-screen Preview feature shows page breaks and page layouts...including underlining and boldface...without annoying blinking or screen flicker. In "Summary" mode, ALLWRITE quickly flags formatting errors without

wasting time printing all the text. These standard features make document preparation faster and easier than ever!

State-Of-The-Art File Handling

There is no upper-limit on document size with ALLWRITE, because it chains files backwards as well as forwards, even across diskettes. Switch from one chained file to another in less than six seconds by pressing two keys. Select portions of other files for inclusion at print time...great for stock paragraphs.

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and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

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Our specially-designed templates fit right on your keyboard to let you see your settings at all times. Each template is also a Reference ("Cue") Card, so it is always right in front of you when you need it, without using up valuable screen space.

ALLWRITE Is Easy To Learn

ALLWRITE's commands and control keys are easy to remember because they use the first letters of common English words: 'CE' stands for 'Center,' 'Search' and 'Replace' do just that, and so forth. The on-line HELP menu offers over fifty screens of topics.

NEWSCRIPT's documentation was acclaimed in every review, and ALLWRITE's 350-page book is even better. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 20 years, and understand the importance of good documentation.

To make installation easy, we include Tiny DOSPLUS for the Models I and III, and special, pre-tailored versions of both TRSDOS 6.2 and DOSPLUS IV for the Model 4, all at no extra charge. The Model I and III versions work equally well with all major DOS's.

PROSOFT'S On-Going Customer Support

Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry. There is no time limit to our support: if you are our customer and you need help, just call or write. We give free updates for 90 days, and charge little or nothing for minor updates thereafter.

Customer Comments

"This is the best software package I have ever received...superb, easy to use, fast, and has more features than the business word-processor at the office." (E.R.L.)

"ALLWRITE is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use."

80 MICRO, Nov., 1984

"Your company and products have to be one of the strongest factors I can think of for keeping me with the TRS-80!" (J.R.H.)

"NEWSCRIPT is the Cadillac of word processors. ALLWRITE is the Mercedes Benz!" (B.E.)

"...a very readable manual." (D.S.)

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If Word Processing is important to you, PROSOFT's ALLWRITE is the best choice you can make. The clean, professional appearance it adds to your letters and reports will make an excellent impression on people. We will be happy to send you free print samples so that you can see for yourself how good ALLWRITE will make you look.

You probably know that quality word processors for CP/M and the IBM-PC sell for \$300-500, and they don't have ALLWRITE's capabilities or speed...or PROSOFT's proven, on-going support. Now, for a fraction of the cost of a new computer, you can have the most complete word processor of all. And you won't have the headaches of starting all over again with a new, different computer.

Note to college students: with its Footnote, Table of Contents and Index features, ALLWRITE is ideal for your reports and Term papers.

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Bonjour, TRSDOS

The first issue of your publication that I received as a substitute for the cancelled *TRS-80 Microcomputer News* contained Andy Levinson's brilliant article "Patch Work" (January 1985, p. 112). I sincerely hope Andy continues this, as there is more to fix on TRSDOS.

Listen all you TRSDOS 1.3 owners: Radio Shack has issued 11 customer service bulletins since the May 1, 1981, release of 1.3. Apparently, only Radio Shack stores, not registered owners, get them; at least, I didn't receive any. After seeing the bulletins in a store, I wrote to Fort Worth and got copies. If you don't have them, go to your Radio Shack store and copy them. Some patches are just typo corrections, but others are important.

Henry H. Herrdegen
Windsor, Ontario
Canada

What's Up, Doc?

I stand up in defense of *80 Micro*'s authors and programmers. I found Alain Cirkovic's Easydata program (December 1984, p. 72) easy to understand and useful. However, I did have a couple of problems that prompted me to write Cirkovic. I received back a copy of the unedited version of the documentation. These instructions answered all my questions except one. Had you printed them as submitted, I, for one, would not have experienced the frustration of not understanding parts of the documentation.

Tom Johnson
Beavercreek, OH

Electric Plug

We've made some changes in Electric Webster since Terry Kepner reviewed the Model 4 version (March 1984, p. 116). One change applies to the Model 4 version only: After proofing a document, Electric Webster now prompts, "Press to make back-up or <enter> to replace document file." In either case, the original file name becomes the corrected text.

All other changes apply to the Models I, III, and 4 versions. The standard version now integrates with word processing programs the same way the correcting version does. In place of the



correcting menu, it displays a menu with the option of sending the list of errors to a printer.

We've eliminated virtually all renaming when you install Electric Webster. Hyphen/EW remains Hyphen/EW. The new Install/CMD program handles installation. The Model I/III version now comes in TRSDOS 1.3 format on one side, and in DOSPLUS double-density format on the other, eliminating the need for conversion for most users.

The grammatical checking feature is now available as an independent program. Also, Tandy will be offering Electric Webster through its Express Order Software service.

Philip Manfield, President
Cornucopia Software
Albany, CA

The Price You Pay

I found Patrick B. Anderson's note to *80 Micro* (February 1985, p. 12) interesting, particularly the part about the IBM PC costing less than his Model III. The lowest price I've seen for the PC is still \$900 more than I paid for my Model 4P with 128K. I can bear to lose a little word processing efficiency for \$900 in my pocket.

E.A. Morris
Sparta, NJ

Cut-Out

As I was looking through my 1984 back issues of *80 Micro*, I saw there were no Reader's Choice awards last year. Have they been canceled like so much of

the other good stuff you used to carry? Will you publish 1985 Reader's Choice awards?

John C. Fowler
Los Alamos, NM

We've canceled the Reader's Choice awards because it's almost impossible to cover all of the Tandy/TRS-80 systems adequately.

—Eds.

Pronoun Protest

There has been a lot of publicity about the lack of females in computer fields, so I was disappointed with the introduction to the Young Programmer's awards in the February issue (p. 49). I draw your attention to this sentence: "We wanted docs that would easily lead the user through the program, telling him what he needed to know to run the program and anticipating any questions he might have."

I would suggest this alternative wording: "We wanted docs that would easily lead the user through the program, explaining the program while anticipating any questions that might arise."

80 Micro should strive to be a leader in encouraging women to participate in all phases of computer use.

Betty Burnett
Emeryville, CA

80 Micro uses the male pronoun by default; the alternatives offer no satisfactory solution. We could use "her," but that is no less sexist than using "him"; we could use the neutral "their," but that is grammatically incorrect; we could use "his/her," but that's awkward and verbose; we could use "user," but that is formal and stilted; we could rewrite the prose as you did, but at some point we would have to refer to a person. In the end, we follow journalistic convention and go with the male pronoun. Fortunately, people generally understand that this is a term of convenience rather than a purposeful bias.

—Eds.

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- ✓ Can be used in BASIC with 2 new commands: PRINT* "I can talk" speaks any expression. PRINT! "Hello" speaks and prints on screen.
- ✓ Reads numbers up to 999 trillion.
- ✓ Speaks many abbreviations, such as Mrs., Mr., lb., oz., Co., etc.
- Walks the dog.
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See the detailed review in 80-Micro December 1984.



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Q: How do you disable the Model 4's break key? Also, how do I get the computer to load a directory from Basic? (Scott Pierce, N. Little Rock, AR)

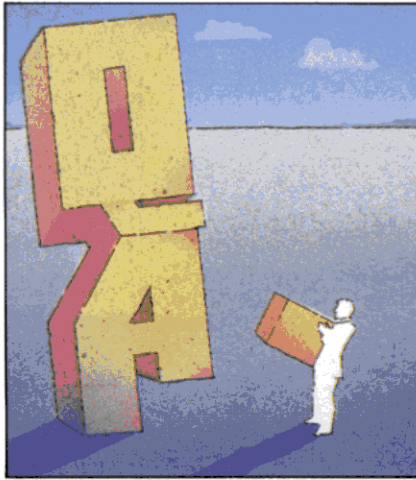
A: So far, Radio Shack has released five versions of Model 4 TRSDOS, each different from the others in important machine-code locations. This makes it almost impossible to find a POKE to disable the break key at the DOS level. Fortunately, TRSDOS includes a command that makes a POKE unnecessary. Type in SYSTEM (BREAK = OFF) at DOS ready and the computer will ignore the break key.

If you're already in Basic, use SYSTEM "SYSTEM (BREAK = OFF)". That should disable the break key without interrupting your program. Similarly, to get a disk directory from within Basic, type in SYSTEM "DIR" as one program line. To return to DOS ready, type in SYSTEM as the program's last line.

Q: In the August 1984 Feedback Loop (p. 18) you told Mario Camo that a few Radio Shack disk drives don't support double-density operation. I'd appreciate some elaboration. I have a Model I with an Aerocomp double-density add-on. My drive 1 (Radio Shack catalog number 26-1160) has 35 tracks; drive zero (catalog number 26-1161) has 40 tracks. I can read double-density disks in drive zero but not in drive 1. Is there a way I can determine if drive 1 is one of those few single-density drives? (Ed Weiner, Huntington Beach, CA)

A: First, use the CONFIG or System command (depending on your DOS) to slow the track-to-track stepping rate to 40 milliseconds or more. It's possible the drive can't keep up with the DOS at faster speeds in double-density mode.

If drive zero writes as well as reads double-density disks, format a double-density disk, store data on it, then put the disk in drive 1 and try to read it. If you have a disk-zapping utility such as Super Utility Plus, use that to access the



disk in drive 1. If your DOS or the disk-zapping program still can't recognize the double-density disk, then drive 1 is indeed single density only.

Q: On my old Model III, I loaded SuperScripsit using the Auto command, resetting the computer to bypass the date and time prompts. However, I recently bought a Model 4P and got an 80-column version of SuperScripsit, and I find I can no longer bypass the date prompt by pressing the reset button. The DOS manual says you must enter the date before any automatic loads; is there a way around this? (Mark Headlee, Edinburgh, Scotland)

A: To turn off the date prompt, boot up your system disk, type in SYSTEM (DATE = OFF) and use the SYSGEN command to save the new configuration to disk. The next time you boot up the disk, your computer won't display the date prompt and your Auto sequence will execute immediately.

Q: For over five years, our company has been involved in developing and marketing a software package that goes by the general name of Computer-Aided Transcription. Our software has run on the Models I, II, 12, and 16. When the Tandy 2000 came out, we converted the program for this computer. Some type of error in the 2000's hardware or in MS-DOS causes the loss of all free space on a hard or floppy disk; apparently this happens when writing a file to disk.

For example, if you have 9 megabytes of free space on hard disk and you write

a 5000-byte file, you've suddenly lost all 9 million bytes of space. The file you're writing is destroyed in the process.

When reading and writing files to or from hard disk, our software uses MS-DOS's function calls 14, 15, 21, and 22 hexadecimal (hex). We know the problem isn't with our program because a Radio Shack dealer has had the same problem running Tandy software on a floppy disk. You can recover the lost disk space using the DSKCHK program, but users who spend hours editing large files lose their work each time this happens, and it happens frequently.

Are you or any of your readers aware of the problem? Do you know of any work-around procedures or programming methods to alleviate it? (Maurice Fowler, Innovative Software Co., Houston, TX)

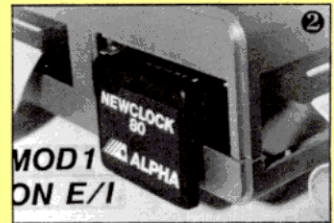
A: Sorry, I haven't heard of the problem. Have you cleared all the CPU registers, set the flags to normal states, set the necessary entry conditions, and made sure the stack is clean? Perhaps some garbage in the registers causes the trouble. Also, make sure you're getting the service call addresses out of the Tandy 2000 programmer's reference manual and not out of an IBM MS-DOS reference book. Tandy's MS-DOS call addresses differ from those of the IBM. Can anyone else help?

Q: After trying Eric Burstein's "More 4P Storage" hint (Reader Exchange, July 1984, p. 32), I had to let you know about my experience with formatting 42 tracks. I was able to format my disks for 42 tracks on a Model III using DOSPLUS 3.5 (Burstein used TRSDOS). It worked perfectly until I had my drives aligned. When I got them back, none of my drives could read anything on the 41st or 42nd tracks.

Radio Shack's explanation was that they support only 40 tracks, and that they aligned the drives within specifications for a 40-track drive. They also said they couldn't do anything else, since they'd never heard of getting 42 tracks out of a 40-track drive. It seems to me that if a drive read 42 tracks before servicing, it should certainly read 42 tracks after alignment. I've been unable to find

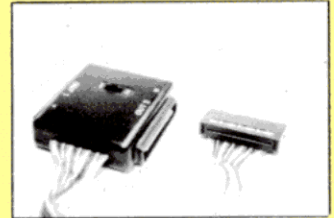
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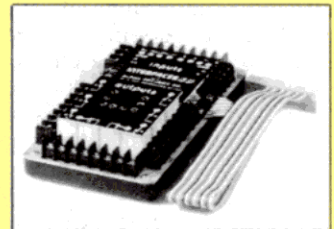
Alpha Joystick \$27.95

When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0) to read the joystick position (8 directions and fire button). Model I: plugs into keyboard or expansion interface. Model III, 4 and 4P: plugs into 50-pin I/O bus. The Alpha Joystick comes fully assembled and tested, ready to plug in and enjoy. (Specify Model I, or Model III,4).



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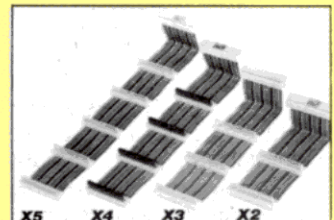
Disk drive cable (34 pin): •2-drive...C162:\$32 •4-drive...C163:\$45

Extension cable, 4 foot: •For printer and drive (34-pin)...C165:\$22

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a solution and would appreciate any help you can provide. (Robert E. Rachlow, Louisville, KY)

A: The problem is with the stepping motor that maneuvers the drive head across a disk. The stepping motor is designed to have 40 stops, but frequently it has more, to give the manufacturer room for error.

To set the motor's alignment, you measure everything from the track zero position. A track zero detect switch sets track zero. So you step the motor backwards, which moves the drive head toward the disk rim until the drive head hits the track zero detect switch. Then you step the head forward until it reaches track 40, normally the last position possible for the stepping motor.

In your case, your stepping motor had two positions left when it reached track position 40, letting you step it further in to use those extra tracks. During alignment, the technician turned the drive motor and repositioned it so the last position became track 40. The extra positions are now beyond track zero's position, and are unusable because the track zero detect switch prevents the motor from moving closer toward the disk rim. Your upper tracks, 41 and 42, are now beyond the motor's reach.

The only solution is to realign the drive-stepping motor. You'll need an oscilloscope, an alignment disk, and a technical repair manual for your disk drive. If you don't know how to realign a drive, find an independent drive-repair technician to do the job for you.

Q: In February 1985 (p. 16), you printed a question from C.G. McProud about using 4164 chips in place of the 4416s commonly found in the Model I. Coincidentally, we ran an article on this very subject in Vol. 5, No. 8 of *Northern Bytes*. We reprinted the article from the Sydney (New S. Wales, Australia) TRS-80 User's Group Newsletter.

If any of your readers are interested in this hardware modification, I'll be happy to send a copy of this issue if you send a mailing label (not an envelope) with your address and 60 cents to cover postage.

In the same issue, James Criscimagna asked how to get TRS-80 block graphics on an Epson RX-80 printer (p. 19). *Northern Bytes* Vol. 6, No. 1 contains a routine for the FX-80 that I suspect works with the RX series as well. The same offer applies to any readers who'd like a copy of this issue. (Jack Decker, Editor, *Northern Bytes*, 1804 W. 18th St., Lot #155, Sault Ste. Marie, MI 49783.)

A: *Northern Bytes* isn't exactly a commercial publication, but it's

not just a computer club newsletter either. It's a promotional publication for The Alternate Source's customers that also exchanges newsletters with TRS-80 user's groups.

Q: After adding a Radio Shack double-density adapter to my Model I, I find I'm having trouble upgrading my software library. I use TRSDOS 2.8, and I'm trying to convert the Edit/CMD program from Microsoft's Editor/Assembler Development package. I'm having problems with calls to DOS address 4442 hex (read specified record from file).

Do you know of any books or other publications dealing with double-density disk input/output (I/O)? I know single-density I/O fairly well, but none of it seems to apply to double-density. The technical manual refers to synching the computer for reliable data I/O. How do I do this?

Also, I find NEWDOS/80 1.0 won't load with the double-density adapter installed. Why? (Carlos H. Matos, Shaw A.F.B., SC)

A: Your problem with location 4442 hex is that TRSDOS 2.8 requires a different register setup from the program you're converting. Since I don't know the program, I really can't be more specific than to suggest that you trace the program's flow with a machine-language monitor and examine the CPU registers just before the program calls location 4442 hex. Compare what's in the registers with the technical manual's requirements for calling that location and reading from disk.

The main difference between single- and double-density operation is the disk sectors' skew rate, since the DOS has more sectors to deal with under double-density. Your DOS might also read and write data differently. Because DOSes differ and the Model I lacks a standard double-density system, you won't find any books on the subject.

As for synching data, the Model I, in single-density mode, uses the floppy disk controller's (FDC's) memory bank for storing disk data. Unfortunately, the FDC chip also uses this space to store information. Usually this is OK, but it can lead to problems when the computer clock's 25-millisecond "heartbeat" interrupts the FDC, destroying the data in its memory area.

Now, in theory, the drive delivers information fast enough so that the CPU can pull it out of the FDC before the clock interferes. But if the drive's timing is precisely right (or, depending on your viewpoint, precisely wrong), it won't start delivering data from a sector until late in the clock's cycle. Remember, the drive has to wait for the right sector to pass

beneath the drive head before it can send data to the FDC. When this happens, the clock destroys the data in the FDC before the CPU fetches it.

This is usually the cause of Model I "Data Lost" error messages. Double density aggravates the situation a bit by making the timing even more critical; sometimes it takes even more passes to read the whole sector than under single-density operation.

Manufacturers other than Radio Shack include a data separator with their double-density boards to remove conflicts in use of the FDC memory area. The only way to establish reliable data transfer without such a separator is to synchronize your data-fetch operations with your computer's clock, delaying reading until immediately after a clock pulse.

NEWDOS/80 1.0 won't load because it doesn't support double-density operation; you'll have to get NEWDOS/80 2.0 or DOSPLUS, MULTIDOS, or LDOS. Be sure to call the manufacturer before ordering a new DOS to make sure it supports Radio Shack's double-density board.

Q: I need information about securing a copyright for software. Can you help? (Darrell Eldridge, Ardmore, TN)

A: Look for the book *Legal Care for Your Software* by Daniel Remer—Nolo Press, 950 Parker St., Berkeley, CA 94710, \$19.95. The Addison-Wesley Publishing Co. distributes it. The book gives most of the information you need to protect your software from illegal copying and use.

Not everyone agrees about the book's value. One lawyer says it's "pretty good" while another calls it "misleading." However, I don't know of any legal text that all lawyers agree is good. The book seems quite thorough, with many useful suggestions and examples.

Q: I'm responding to Hugh Ruppertsburg's complaint about Model 4 SuperScript's losing characters during wraparound (January 1985, p. 19). I suspect that his operating system may be at fault.

The Model 4 SuperScript upgrade package I recently received from Radio Shack contained SuperScript 1.0.1 and TRSDOS 6.1.1. I, too, noticed the program's tendency to lose characters during wraparound, a problem I didn't have with Model III SuperScript running under LDOS. SuperScript's command response also felt sluggish. When I moved Model 4 SuperScript to a TRSDOS 6.2 system disk, I found that these problems disappeared.

TRSDOS 6.2 is an optional upgrade that you have to buy from Radio Shack. According to the catalogue, it operates

up to 20 percent faster than the 6.0 and the 6.1 versions and includes many technical enhancements. The mandatory upgrade that I (and many other Model 4 owners I know) received free of charge from RadioShack was version 6.1.2. Hugh Ruppensburg might not find that version fast enough for SuperScripsit. (Jane A. Lauman, Waukesha, WI)

A: You're right; you can attribute SuperScript's losing characters to the DOS. Getting 6.2 should solve this problem most of the time, but it's still possible to lose characters if you're a fast typist.

Q. Like Howard Feldman, I was disappointed to discover that the Model 4/4P has no Basic sort routine comparable to CMD"O". I took your advice to Feldman in the November 1984 column (p. 16) and typed in the machine-language sort published in the July 1980 *TRS-80 Microcomputer News*, but I can't get it to work on my Model 4P.

I modified the program by substituting 255 for 127 except for its first occurrence, replaced line 30 with DEF USR0=&HFF00, entered Basic with M=65279, removed the 10000 after the Clear statement, and changed lines 1240 and 1260 as indicated. When I run the program, it works nicely through line 160, but when I press the enter key the computer hangs up. I've looked for hints in the Model 4 manuals, but I can't find any.

I have the feeling the problem has something to do with the first three machine-language statements, 205,127,10, which is a Model III ROM call CD 7F A, but I can't figure out what to replace them with or what else to change in the program.
(Charles H. Samuel, Tigard, OR)

A: The program was originally for the Model I, so I don't think your problem could be a ROM call—the Models I and III ROMs just aren't the same. The program works on the Models I, III, 4, and Lobo Max-80.

Rather than try to trouble-shoot the program, type in Alan D. Smith's Model 4 Basic sort in the March 1985 *80 Micro* ("A Sort Story," p. 70).

9. I downloaded several programs from 80 Micro's bulletin board, saving them to disk as File name/TXT in both edited and unedited format.

How do I transform the downloaded programs in text format to executable Basic programs? I don't have a text editor. (Gary V. Van Dyke, Sycamore, IL)

A Use a simple Basic program to line input the text and edit it. To fix Basic lines so they aren't broken into separate sections, write a subroutine

***When the refrigerator
started or the
toaster toasted,
garbage appeared.***

that displays each line of text and asks you whether the line belongs with the previous line. When you answer no, the routine should write the previous line to disk and save the current line in memory in case it's continued on the next text line. This is time-consuming, but it does work.

80 Micro published a text editor program in November 1984 (see "Hybrid Vigor," p. 72).

Q: I just blew my fifth power supply and the local Radio Shack stores don't know where to get a replacement. I have a 16K Model I Level II with Expansion Interface, two 40-track disk drives, a printer, acoustic modem, voice synthesizer, and Alpha's Newclock 80. As you can see, my system needs a lot of power.

I designed my system for 24-hour use. It wakes me up, reminds me to take my pills, makes my phone calls, and so on. I wrote my own software, including a full-screen editor, word processor, and assembler, and it's hardware dependent, especially on the clock and voice synthesizer. It would take years to transport these programs to another computer. Help. (Wayne Moore, Smithville, MO)

A: The Model I's power supply is a power transformer that drops the 120-volt wall supply to 24-volt and 17-volt ac levels. The transformer then rectifies the 24-volt ac to 19.8 vdc and puts it on the power cord's pins 2 and 4. The 17-volt ac goes on pins 1 and 3, and all four pins feed directly to the Model I.

The vdc line is limited to .35 amps and the other line is limited to 1 amp. All you have to do is get a bigger power transformer (the original's setting is 50 watts) and increase the rectifier to handle your extra current load—say, .5 amps. You could probably get any good technician to build a new power supply inexpensively.

Q: How do I get my Model 4 under TRSDOS 6.2 to recognize logical drives 2 and 3—I need a patch. (Yulee Johns, Glen Burnie, MD)

A You don't need patches to enable logical drives 2 and 3, assuming they're physically attached. Type in DEVICE to display the current drive configuration. If you have the external drives

on the expansion cable, with disks in them and the doors closed, you should see them listed in the device table.

If the table indicates the drives are disabled, use `SYSTEM (DRIVE = 2,ENABLE)` and `SYSTEM (DRIVE = 3,ENABLE)` to make them accessible. Now try the device command; also, read from and write to the drives. When you're satisfied with the setup, use `SYSGEN` to save the new drive configuration to your system disk.

Q: I have a Model I with Radio Shack's Expansion Interface (EI) and two disk drives. I want to add an RS-232 port without having to buy the complete interface; do you know of anyone who still markets the port only?

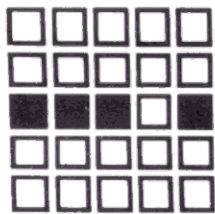
Also, I've been having trouble with my Epson MX-80 printer. It usually happens right in the middle of a long listing or a mailing label printout—whenever it will create the most havoc. All of a sudden, the printer takes off like crazy, usually dropping into compressed mode, and printing garbage that looks like this:
 ///0000000000000000000000000000///.
 I've replaced all connectors with gold plugs, but the problem continues. (*Jeff Briner, Hickory, NC*)

A: The Radio Shack franchise in Brattleboro, VT (802-257-5229) still has a few Radio Shack RS-232 boards for the Model I Expansion Interface. Before installing the board, drill five or six half-inch ventilation holes in the RS-232 compartment sides and lid. Make sure you clean the RS-232 edge-card connections with alcohol to remove dirt and corrosion.

After putting the board in position and screwing it down, get a large pink eraser and cut it just to fit between the RS-232 board (over the connection to the main EI board) and the compartment lid. This prevents the RS-232 board from heat-warping and pulling away from the RS-232 board connector.

Your printer problem sounds like a voltage spike or current surge. Somehow, one or more extraneous characters are getting into the printer's buffer, causing it to misbehave. I had a similar problem with an external hardware printer buffer; every time the refrigerator started up or the toaster toasted, garbage appeared in the buffer. The cure was to install a spike and surge suppressor on the printer and the printer buffer (see "Current Events," May 1985, p. 62, for a guide to buying surge suppressors). ■

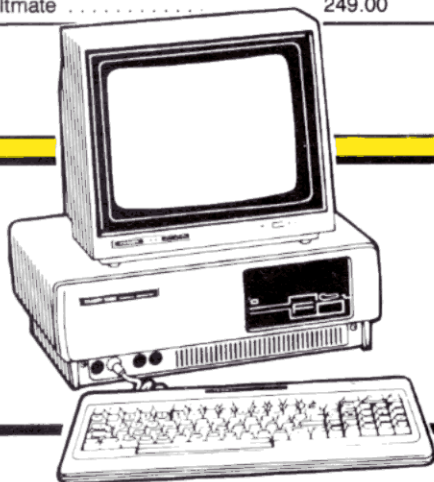
Terry Kepner is a freelance writer and programmer, and an associate editor for 80 Micro. He's been writing about microcomputers since 1979.



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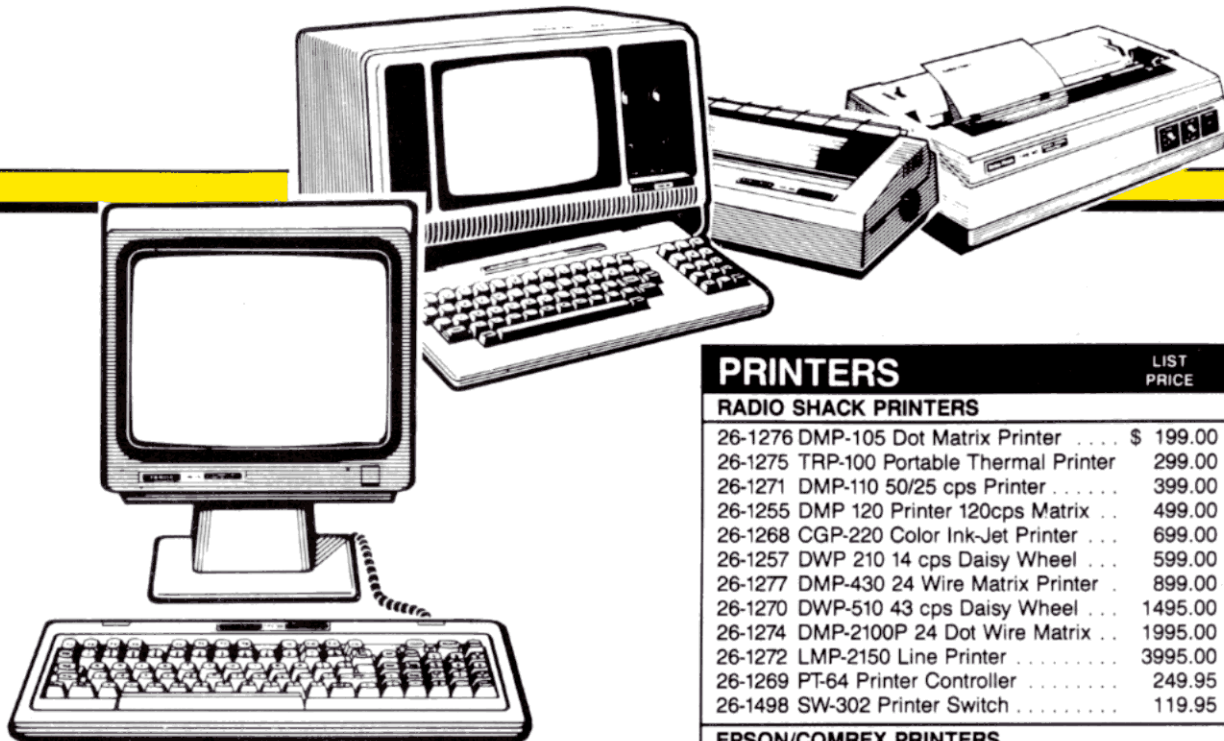
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Tandy's ACT Pact: Uneven Trade?

Tandyland

When Tandy finalized its limited retail agreement with Great Britain's Applied Computer Techniques (ACT), makers of the 8-bit Apricot home computer, the January 1985 deal was significantly different from the one first announced in December 1984 (see Pulse Train, April 1985, p. 21).

As things now stand, Tandy and ACT have dropped plans for jointly owned stores in both Europe and England; the only place you'll find AT stores is in the United Kingdom. Stores selling both Tandy computers and ACT's Apricots are called AT ComputerWorld Ltd., not TA ComputerWorld as originally planned. In all, 18 Tandy Computer Centers and 20 ACT ComputerWorld franchises merged and began business in England under the new name on February 1, 1985.

As far as the European market goes, ACT will supply Apricot products (see the Photo) to all 46 of Tandy's electronics stores that have a business computer department. The final tally shows ACT picking up distribution of its Apricot in all Tandy computer stores in the U.K. and Europe. Tandy gets increased distribution only at ACT's 20 stores in Great Britain. The deal's apparent lopsidedness has some people wondering.

According to Luc Sala, a reporter for International Data Corp., the merger worries Tandy employees in England. Rumors are circulating that poor sales in Europe might prompt Tandy to pull out of Europe and the U.K. altogether. "That's ridiculous," says Tandy's director of financial planning, Garland Asher. "There's been no contemplation to do that." Asher blames weak European sales solely on the strong American dollar.

Execs in the Tandy Towers have to field questions about rumors almost every day, but the phones were abnormally busy after *InfoWorld's* John Dvorak passed along some Tandy gossip in



Photo. ACT's Apricot.

his March 4, 1985, Inside Track column.

An anonymous source tipped off Dvorak to some hot rumors making the rounds in Fort Worth. Perhaps the most provocative has Tandy bringing out a PC AT clone sometime in 1985's third quarter. Tandy maintained its usual solitary stance when questioned on the subject.

As for the potential rivalry between a high-priced AT clone and the Tandy 2000, financial planner Asher said, "I don't think you can assume (the two machines) would be mutually exclusive in terms of function or price if such a new machine were to be introduced. Besides, the Tandy 2000 is selling for \$1,999 right now."

Dvorak also cited a rumor that Tandy's considering importing an Apple clone that would go for about \$500 at Radio Shack Computer Centers.

Asher put the damper on that one, saying it would be foolish to add another piece of hardware to the load Computer Center personnel must currently support, to say nothing of supporting another nonstandard operating system. Tandy made its choice in getting on the MS-DOS bandwagon; selling Apple look-alikes would be a move in the wrong direction.

Dvorak's inside source also speculated that Tandy would sell its computer division if sales didn't improve. Asher had already heard that rumor, and he ended our Q and A by simply stating, "To

throw away a billion dollar part of our business would be stupid."

All the hype surrounding the success of the Tandy 1000 makes some computerists wonder how long the unit's price will stay at \$1,195 while its main competitors, the PCjr and the Apple IIc, retail for \$995.

Tandy's buyer for the 1000, David Frager, commented on the rumor that Tandy might reduce the price of his machine. "There's no truth to that," Frager said. "The machine

is still selling very well. Besides, we wouldn't change the price for at least six months. At least not until the July catalog comes out." Frager also told me Tandy had no plans to introduce a portable version of the 1000. He added that Tandy has dropped the idea of a special stripped-down 1000 for the education market. "The education market is responding well to the 1000 as it is," Frager said. "There's no need to bring out a model just for that market."

Readers who follow Tandy's financial ups and downs know there was reason to celebrate in Fort Worth after the release of January's sales figures. Consolidated sales totaled \$235,678,000 for a gain of 5 percent over January 1984.

In Tandy's Radio Shack division, the news was equally good, with sales topping \$171 million in January. That's a 6 percent increase over the same month last year. And Tandy may be making gains with the 1000 on another front: its campaign to build a stronger media image. According to estimates, the Tandy 1000 made the cover or appeared prominently in 22 computer magazines in December 1984 and January 1985.

MicroTrends

If you have any doubts about the microcomputer market's competitive-

ness, just look at the money big companies spend on advertising. C Systems Ltd., specialists in advertising analysis, tracked micro manufacturers' 1984 print advertising in 155 publications.

As you might expect, IBM leads the pack with nearly \$30 million in ads. AT&T posted expenditures of \$25 million, while Hewlett-Packard placed third with a \$15 million advertising outlay.

Apple, Texas Instruments, and 3M Corp. trailed HP, each spending nearly \$9 million. The report didn't mention Tandy, and I asked C System's James Callan why. "Tandy doesn't advertise as much as you'd expect," he told me. Instead, "they use a lot of co-op advertising." In other words, Tandy chips in for advertising of another company's product (such as software) in which a Tandy product appears prominently. C Systems doesn't track co-op advertising.

It turns out that Tandy bought 364 pages of advertising outright at a cost of \$3.5 million. Where did the money go? Frequent flyers got a good dose of Tandy ads, which appeared in several airlines' in-flight magazines.

Callan thinks in-flight ads are effective. "There are few places during the month when a businessman has time to read more than just what comes across his desk. In the air, though, computer companies have a captive audience that is given free and accessible information to read and an opportunity to read it."

Tandy also advertised in business magazines such as *Business Week*, *Forbes*, and *Venture*. Science magazines tend to be favorites with computer companies, too, and Tandy ads appeared in *Discover* and *Popular Science*.

Most of Tandy's print dollars, however, went to system-specific magazines. *Rainbow* ran 24 Tandy ads last year, more than any other magazine. *80 Micro* and *Hot CoCo* tied for second with 23 ad pages apiece.

Office micro systems enjoyed U.S. sales of \$6.6 billion in 1984, according to Future Computing Inc. Meanwhile, Dataquest Inc. reports that worldwide sales of office microcomputers hit \$26.3 billion last year. Despite all this money changing hands, Future Computing says that U.S. offices contain only five million personal computers out of a potential market of 55 million desk-bound office workers.

Dataquest and Future Computing's studies give IBM the largest piece of the office computing pie (41.5 percent U.S., 30 percent worldwide). Apple is a distant second in U.S. (11 percent) and worldwide (9 percent) markets. Tandy takes third in the U.S. market with 6.3 percent of the business users, but worldwide, Tandy drops to fifth place with a 3 per-

cent share (see the Table). Tandy might owe its stable number-three U.S. position to its 15 percent market share in Unix systems, which leads all sellers in the multiuser micro market.

Manufacturer	Worldwide (%)	U.S. (%)
IBM	30	41.5
Apple	9	11
DEC	4	3.7
Hewlett-Packard	4	3.9
Tandy	3	6.3
NEC	3	NL
Compaq	2	4.5
Wang	2	3.7
Zenith	NL	3.2
Kaypro	NL	1.7
Other	43	20.5

Table. Shares of the office computer market. NL indicates no listing.

Most of the micro world's heavy hitters were represented at a February 1985 manufacturers' seminar to watch Digital Research roll out its new operating environment, GEM. It looked as if DRI had the jump on Microsoft, whose late, late Windows program may finally come out this summer.

In light of Tandy's presence at the seminar, I asked Tandy's director of market planning, Ed Juge, what Tandy's plans were for GEM. Juge reported, "[We have] no specific agreement with DRI." Juge says Tandy's interested in GEM but is still committed to Windows.

Asked if GEM already had too much of a head start on Windows, Juge said he felt that Microsoft had the operating system world locked up, despite its failure to bring out Windows on schedule.

For years, CompuServe subscribers could find lively discussions about TRS-80 microcomputing on the MNET-80 SIG (special-interest group). But due to a decline in SIG activity over the past year, CompuServe decided to close down MNET-80, its longest running SIG.

Though CompuServe still has two Radio Shack-related SIGs, the TRS-80 Professional SIG and the Color Computer SIG, MNET-80 veterans feel the loss. Bob Snapp, president of Snappware, reflected, "The Model I is gone; the Mod III is up for sale. They, like MNET-80, have been replaced by the next generation. In any event, it is always sad to see the passing of an old friend."

Another former SIG member, Bob Spargo, agreed. "One of these days, my Model I is going to find its way out of the office towards its final destination: computer heaven (a/k/a the city dump). I'll miss it... I'm sad to see MNET-80 die too."

MNET-80 hasn't vanished without a trace, however. Members saved parts of its data base and moved its more important files to the TRS-80 Professional SIG. You might say an old SIG never dies...its files just get transferred.

Hot Items

To succeed at selling home computers, you've got to "know your consumer," according to Rai Wasner, an analyst at Boston's Yankee Group market research firm. Yankee profiled the personal computer user for its clients in a 12-volume survey. The survey's personal activity section offers some interesting statistics on the typical Tandy home computerist:

- The average Model III/4 owner spends about six hours a week listening to records or tapes.

- He or she spends 11½ hours a week watching television. Tandy owners like the evening news best, but for entertainment they most often watch "Knight Rider." They also display a fondness for sitcoms. Among all computer owners surveyed, "Hill Street Blues" tops the most-watched list.

- Among all computer owners, TRS-80 types spend the least amount of money per week on magazines, but they're number two in money spent on books. IBM owners are number one.

- After Commodore 64 owners, Radio Shack computer owners spend more money in video arcades than any other computer owners.

- The average Tandy computer owner spends about \$6 a week on movies.

- Fifty-six percent of Model III/4 owners also use TRS-80 computers in school. Twenty-eight percent use Apples. By comparison, 78 percent of Apple owners use Apples at school while only 10 percent use TRS-80s at school.

- Tandy computerists listen to all kinds of music on the radio but, more than any other group, they also like to listen to all-news stations. CoCo users are evenly split between country music and rock.

- Tandy owners tend to be married, although their divorce rate is three times that of other computer owners.

- Model III/4 users make half as much money as IBM owners.

- Ten to 20 percent of the Radio Shack owners surveyed own their own businesses.

- The typical Tandy owner spends five and one-half hours a week working at home.

- Tandy owners tend to be nonpolitical. They also participate less in cultural activities, like going to the opera or museums, than other computer enthusiasts. ■

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Install the card-edge connector to the ribbon cable with the blue-striped conductor at position 1, and plug the connector into the Model 4P with the blue stripe toward the outside of the case. I left the Model 100 header connector in place on my cable, and can now use one cable for both computers.

Michael Shrout
200 N. 35th Ave. #98
Greeley, CO 80631

Debugging CP/M

Regarding my article, "The Dating Game" (October 1984, p. 114), I've discovered another bug in the CP/M Plus date routine. The faulty code is in the section following that where I corrected the leap year problem.

CP/M plus adds the days of each month to the Date variable in the system control block. Unfortunately, it uses the A register



to hold the date total. This is a single byte register that holds 256 decimal, not the 365 required for total days. After September, the dates start over: Oct. 1 becomes Jan. 18.

The BIOS patch in the Figure uses the IX register to eliminate the problem. Put your working version of DOS in drive 1. Drive zero should contain SID and Set; the default drive is zero. Type in SET B:CPM3.SYS (RW) and SID B:CPM3.SYS.

Charles F. Alexander
188 E. 11th St.
Clifton, NJ 07011

Banked Version	Unbanked Version	Banked Version	Unbanked Version
S0553	S04C4	CD	CD
16	16	68	D9
00	00	F1	E7
DD	DD	2A	2A
21	21	F4	F4
00	00	D2	CA
00	00	DD	DD
5E	5E	E5	E5
DD	DD	D1	D1
19	19	19	19
0D	0D	06	06
23	23	00	00
C2	C2	09	09
D9	4A		
F0	E7	WB:CPM3.	WB:CPM3.
2A	2A	SYS.100.	SYS.100.
87	F8	5CFF	3FFF
F1	E7		

Figure. BIOS patch to correct CP/M Plus's addition of months. Press the enter key after you enter each line of data.

Big Difference

I use a technique similar to that described in "The GW Difference," by Jim Heid (February 1985, p. 42) to simplify writing programs that require PRINT@ statements on the Model I/III.

By defining the PRINT@ location (with the DEF FN command) as $FNL\%(A\%,B\%) = (A\% + 1) * 64 + B\% + 1$ in the beginning of the program, you won't have to consult screen charts to locate the print position. A PRINT@ statement then looks like: 100 PRINT@ FNL%(3,10), "Here". This is similar to GW-Basic's Locate 3,10 statement.

Also, LPRINT TAB allows a tab only to 127 on the Model III (63 on the Model I). The line DEF FN T\$ (A\$,B\$)=STRING\$(B\$ - PEEK(16539),32) lets you tab to 255.

John M. Tuttle
58 Broadlawn Village
Ardmore, OK 73401

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—Eds.

Quick Cubic

The following changes make my Cubic program ("Formula Solutions," January 1985, p. 116) run faster and more accurately.

In line 120 change ,140 to ,135, and in line 150 change GOTO 140 to GOTO 135. Also, add these lines:

```
135 IF FNB(S)=0,H=S: GOTO 160
136 IF FNB(L)=0,H=L: GOTO 160
```

Finally, delete CC = 32 in line 20; it's a useless remnant of an earlier version of Cubic.

Mike O'Neal
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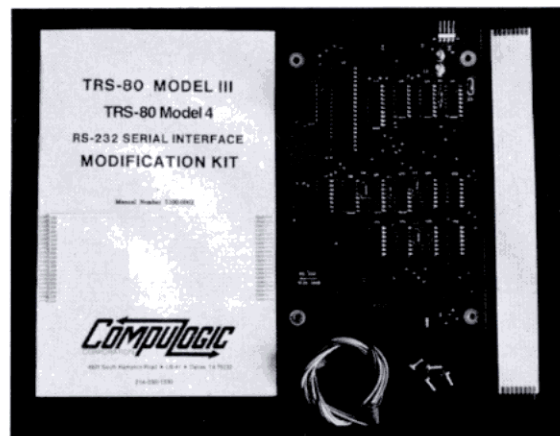
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Random Roots

Bob Barringer wanted to know how to seed the Model III's random number generator (December 1984, p. 29). The III stores the seed as a 24-bit number at location 40AA-40AC hexadecimal (hex) (16554-16556 decimal). The Program Listing shows how you can set the seed number.

Also, memory location 4210 hex (16912 decimal) is a flag buffer for Basic. The Table shows the effect of changing bits 0, 2, and 3.

Jim Foss
675 Alvarado Ave. #16
Davis, CA 95616

Aid Forum

I have a Base 2 Model 800 printer and need software and technical information for it. I'm also interested in software that uses the printer's dot graphics capabilities, including any bar code programs.

Also, does anyone know of any software that I can adapt to the Base 2 for bar code applications?

Donald Grevenow
292 Barkley Place E.
Whitehall, OH 43213
CompuServe #72425.352

Here in England, no magazine caters specifically to the TRS-80. I have a range of English computer magazines with broader, multicomputer coverage. I'll swap them with anyone who can offer me back issues of *80 Micro*.

Paul Cash
18 Penk Ridge
Havant, Hants PO9 3LU
England

We won't swap, but FYI, back issues are available from the Back Issue Order Dept., 80 Micro, 80 Pine St., Peterborough, NH, 03458.

—Eds.

Arnold E. Van Beverhoudt Jr.'s Graphmaster program ("By the Numbers," February 1985, p. 68) is terrific. I only wish I had the expertise to make the print option work on my Radio Shack LPVI printer. Has anyone done that?

Marlin Swettzer
2324 S.E. 52nd Ave.
Portland, OR 97215

Send correspondence to Reader Exchange, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

Bit	Function
0 (Set)	Turns on real-time clock (CMD "R")
0 (Reset)	Turns off real-time clock (CMD "T")
2 (Set)	Set text mode to 32 wide (PRINT CHR\$(23))
2 (Reset)	Set text mode to 64 wide (PRINT CHR\$(28))
3 (Set)	Set special character set (PRINT CHR\$(22))
3 (Reset)	Set alternate characters (PRINT CHR\$(22))

Table. Bits and functions at location 4210 hex.

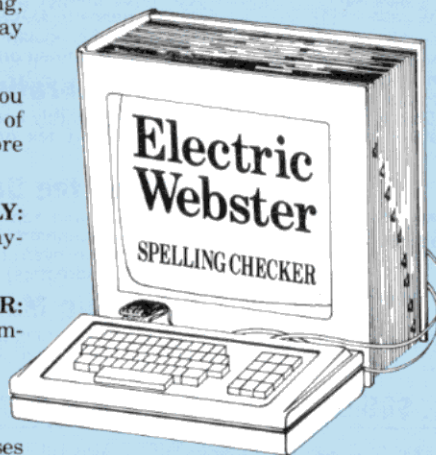
Program Listing. Program to set seed number.

```
10 POKE 16554,10: POKE 16555,10: POKE 16556,10
20 FOR I=1 TO 20: PRINT RND(100),: NEXT I
30 POKE 16554, 10: POKE 16555,10: POKE 16556,10
40 FOR I=1 TO 20: PRINT RND(100),: NEXT I
```

End

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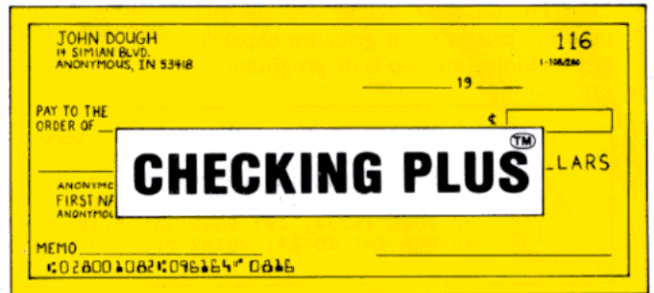
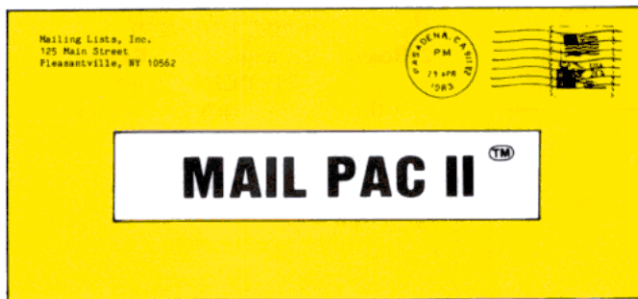
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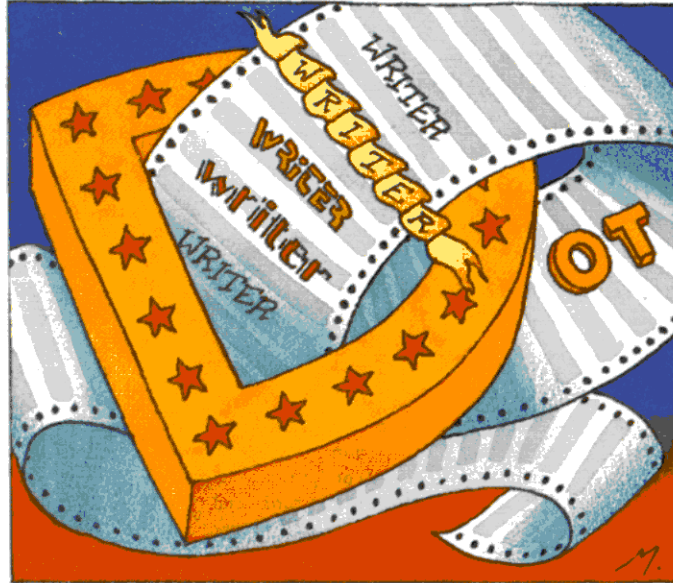
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It's hard to find much that's unique in word processors today; they all provide the basic functions necessary to prepare and print text. New twists in text processing now come from document formatters, software that lets you dictate the final appearance of a document. Formatters have gotten so sophisticated that they're almost at-home typesetters. Prosoft's newest version of their text formatter, DotWriter 4.0, exemplifies this. DotWriter gives you a plethora of text formatting commands, offers 14 type fonts, (see Fig. 1) and produces high-resolution graphics within text. It works with any word processor that saves text in ASCII format, is easy to use, and won't break your bank.

Features

You control your document's appearance by embedding DotWriter commands in your text, to the exclusion of your word processor's own formatting commands. Since DotWriter provides default settings for almost all its commands, you only have to program those features of particular interest. With a simple letter, you could just specify the letterset you want to use and leave almost everything else to DotWriter.

If you want to customize your documents, however, DotWriter accommodates you. It lets you set margins (left, right, top, and bottom), page lengths, text



indents and offsets, top and bottom title margins, line height, and line spacing. You can also center text, allow space for a logo on the first page of a document, and set horizontal and vertical accent lines (see Fig. 2).

DotWriter's text control commands include those to start new paragraphs, turn on proportional printing (even if your printer doesn't have that feature), set the spacing between characters and words, invoke reverse printing, and enlarge letters. The commands also control double-strike and emphasized printing, text justification, and lettersets for your main, title, and alternate typefaces.

One command forces a new page immediately while another forces a page only if fewer than a specified number of lines remains on the current page. You can turn on and off automatic page numbering.

DotWriter provides ways to highlight specific portions of your text, too (see Fig. 2d). As shown by the double-width italics (the alternate font), you can use the command codes in combination with each other.

DotWriter also provides kerning, a feature not normally found in text formatters. Usually, a print formatter prints letters independently of one another, but kerning takes letter "overhang" into account when printing. For example, in the

word "To," DotWriter tucks the small "o" under the "T." Kerning is helpful in giving italicized letters the same apparent spacing as a Roman letterset. Figure 2b illustrates its effect.

DotWriter supports vertical tabs, which let you return to a specific vertical location in your text. You can use the new vertical tab command to insert tables, and graphs in your text.

DotWriter supports vertical tabbing in your printout as well. When you insert the Skip command in your text with a parameter of -1000, for example, the printer returns to the desired location on the page, whether it

has to forward or reverse line feed. Then you can adjust margins and line length, change lettersets, or do whatever else you need to do.

Figure 2 was printed using an extension to the Skip command that forces reverse line feeds on those printers with that capability, such as the C. Itoh 8510/1550 and the Epson FX series. As with forward line feeding, you can specify the exact number of lines the printer should back up.

Like a commercial typesetter, DotWriter 4.0 lets you set columns of text, with or without a vertical line separating them. You can set the number and width of text columns, too, within the constraints of your preset line length.

You can use the vertical tabs with the column feature. On the first page you want a column printed, you can start printing the full line length, then mark the vertical location and start column printing. On subsequent pages, column printing will start at the top margin and continue until you turn off the command. A conditional column command, similar to the conditional page command, forces a new column if more text lines than a set number are available.

For those writing reports, papers, or even software manuals, DotWriter can prepare both a table of contents and an index as it prints a text file. The resulting

table of contents and index files follow a default format and, prior to printing, can be edited like any other DotWriter text file. (Multiple text files printed as one using the Append command will produce a correctly paginated table of contents and index files for the complete document.)

DotWriter offers several ways to insert text into your file. First, you can embed a new file anywhere in your main file. This is useful for standard headings, salutations, closures, and boilerplate paragraphs. Second, you can chain files together. Third, you can enter a line of text from the keyboard during the printing run.

Improvements to the original DotWriter include better error-handling and a soft hyphen command.

Printing

DotWriter uses your printer's bit-image graphics to print a variety of letter styles and high-resolution graphics.

Print density (the number of dots per inch) varies widely among printers, and on some, such as the C. Itoh and Radio Shack DMP printers, you can control it within a specified range. It provides another way to customize the appearance of text, as well as to pack more text into a given space. Figure 2c demonstrates the effect of varying the pitch, where PI2 is the default setting.

DotWriter provides an Ignore command that lets you skip over all text and format commands, process commands but ignore text, or ignore only the commands that set the main, alternate, and title lettersets. This is especially useful to check rough drafts and refine writing efforts.

You can stop the printing process at any time and enter a valid DotWriter command from the keyboard. The command takes effect immediately but will not become a permanent part of your file. This gives you the chance to correct command errors and omissions on the fly. DotWriter interfaces directly with both NewScript and AllWrite from Prosoft, making these two particularly easy to use as editors for preparing DotWriter text files.

You can also send multiple ASCII values to the printer to use all its capabilities, including those not directly implemented in DotWriter. For example, if you have a color printer such as the C. Itoh 8510SCP or the Radio Shack CGP-220, you can print in color as shown in Fig. 3. This gives you a hint of what you can accomplish with some ingenuity.

New Features And Enhancements

The enhancement most apparent with DotWriter 4.0 is speed. Prosoft completely rewrote version 4.0 in machine language, so that DotWriter prints normal text files virtually nonstop. Another improvement is in proportional printing. At print time, the program checks the width table of the current letterset to process text into proportional lines. Figure 2a shows the difference between standard and proportional printing.

Other improvements to the original DotWriter include better error-handling and a soft hyphen command. A hyphen is printed only if the soft hyphen symbol occurs at the end of a line; otherwise it is discarded. You can insert a page range command at the start of the text file or entered at the start of print processing. DotWriter will print only the text in the specified range.

Options

In addition to the 14 standard lettersets supplied with DotWriter, ProSoft offers 36 optional font disks, each containing from three to 12 different lettersets. Figure 4 illustrates some of the 235 optional letter-

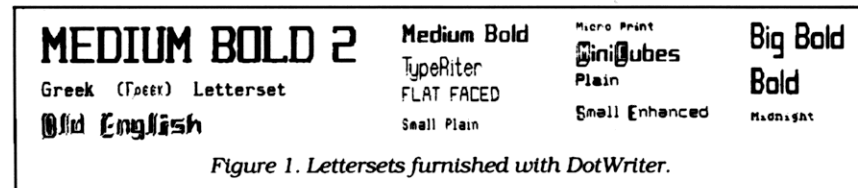


Figure 1. Lettersets furnished with DotWriter.

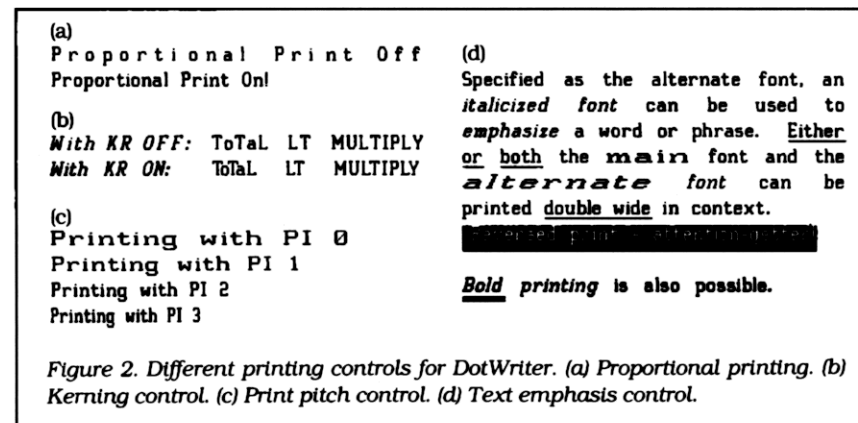


Figure 2. Different printing controls for DotWriter. (a) Proportional printing. (b) Kerning control. (c) Print pitch control. (d) Text emphasis control.

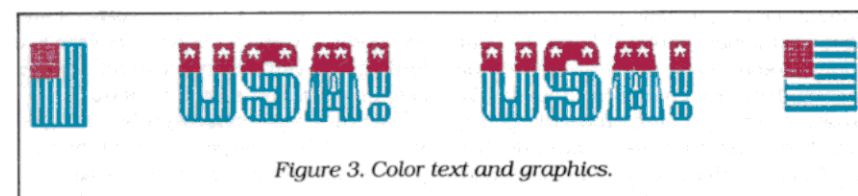


Figure 3. Color text and graphics.

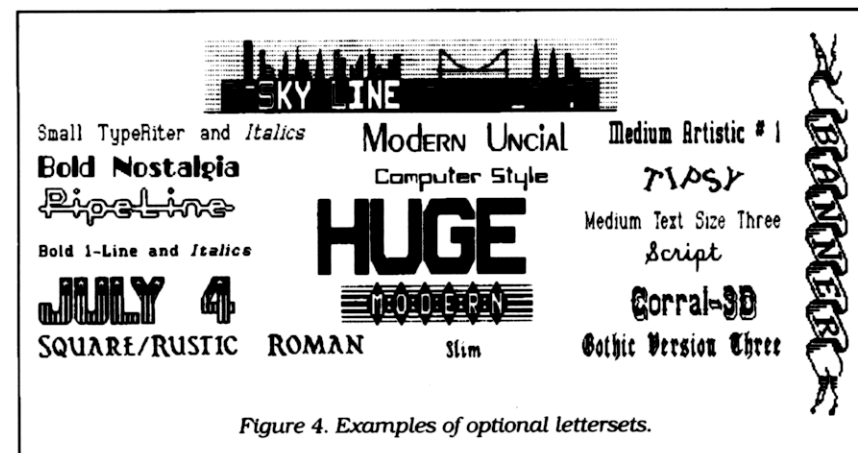


Figure 4. Examples of optional lettersets.

sets. Each optional font disk costs either \$17.95 or \$24.95, depending on the type of font. ProSoft also provides a custom font disk service that lets you pick a minimum of 10 fonts on one disk, at \$5 per font.

Despite the huge number of fonts available, you may need to create a new letter-set, modify an existing one, or perhaps design a logo. For these purposes, the Letterset Design System (LDS) is available, which comprises two parts: the Tiny Graphics Editor and Programmer (TGEAP) and the Letterset Manipulation Utilities (LSMU).

TGEAP is the drawing program used to create or modify letters or graphics on your monitor screen. LSMU lets you refine, combine, change the sizes and positions of symbols in your lettersets, and proportionalize the letterset. Both programs execute quickly. The LDS is only offered in a Model I/III version because of the unsymmetrical graphics on the Model 4. But letterset files prepared with LDS are directly usable on the Model 4.

Conclusions

DotWriter 4.0 has been debugged thoroughly. The documentation (typeset with DotWriter) is clear and thorough. It includes a table of contents, an index, a tutorial on getting started, and an explanation of each DotWriter command. A number of helpful hints on using the program are also included. Overall, the documentation is excellent.

Despite all the improvements made to DotWriter, the cost has risen only \$10 since version 1.5 became available in late 1982. If you want to produce documents or text with something more than the standard printer fonts, DotWriter may be just what you're looking for. ■

The Star Ratings

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Good docs: Is the documentation clear and helpful in explaining the product's use and anticipating user problems?

Bug free: Did the reviewer encounter any bugs while using the product?

Does the job: How well does the product do what it was designed for?

Hard-Driving NEWDOS/80

by David Dalton

★★★★★

The NEWDOS/80 Utilities runs on the Model III and requires one disk drive and either NEWDOS/80 2.0 or 2.5. Sold by Software Success, P.O. Box 1048, Windsor, CA 95492. \$49.95. Supported by Newsoft Products, P.O. Box H, Fulton, CA 95439.

Easy to use: ★★★★★
Good docs: ★★★★★
Bug free: ★★★★★
Does the job: ★★★★★

All Model III disk operating systems have their loyal users, and this is certainly true of Apparat's NEWDOS/80. Once you get accustomed to rambling commands like:

COPY,0,4,.,NFMT,USR,CBF,CFWO,/DAT,
SPDN=8

you can't live without them. But NEWDOS/80 lacks certain useful utilities, particularly those that help in file handling.

The NEWDOS/80 Utilities address this shortcoming. It provides four utilities: one puts your directories in alphabetical order (DIRSORT), one restores a killed file (UNKILL), one displays a list of killed files whose names are still in the directory (DFLIST), and one sets aside memory for use as a printer spooler (RAMSPOOL).

The NEWDOS/80 Utilities is particularly useful for NEWDOS/80 users who consistently work with a large number of files, especially owners of 80-track drives or hard disks.

DIRSORT

I have a 10-megabyte hard disk on my system. It's sectioned into eight logical drives, which means that the hard disk acts like eight very large floppy disks. There's room for a total of 1,968 files. Finding one file in a directory of almost 2,000 files can be a pain. Until now, I hadn't seen a useful utility for managing files on the hard disk.

DIRSORT handles the problem of long directories in a unique way. If you type in DIRSORT,2 the program reads the directory on drive 2, sorts the file names, and rewrites your DIRSYS in alphabetical order. As you add and kill files, the directory works its way out of order again, but all you need do is use the DIRSORT command again. I've found this helpful, and DIRSORT's quick and easy to use.

UNKILL

If you've ever killed a file and wished you hadn't, you'll like UNKILL. When you

kill a file, your DOS doesn't actually erase it from the disk. It makes certain changes in the directory, and frees up the killed file's space.

Just type in UNKILL followed by the file name, and you've got your file back (unless you've overwritten it with another file). If UNKILL can't restore the file, it generates the message, "Unable to restore file. Granules have been reallocated."

DFLIST

The DFLIST command provides a list of killed files whose names still appear on the directory. Type in the command DFLIST,2 and you'll get a list of all the files on drive 2 you've killed. These files are candidates for the UNKILL command, since DFLIST doesn't check to see whether the files can be restored.

RAMSPOOL

NEWDOS/80 comes with a printer spooler, ASPOOL/MAS, but I haven't really used it much. The NEWDOS/80 Utilities' RAMSPOOL is better. It sets aside high memory for use as a printer buffer, then runs the printer as a background task using interrupts.

A computer uses interrupts to do different tasks at the same time. It has a schedule of background tasks, such as updating the real-time clock and making your cursor blink. RAMSPOOL adds printer buffering to this schedule, with no noticeable slowdown in execution speed (except during disk input/output, when even your real-time clock is ignored).

RAMSPOOL provides a number of parameters for turning spooling on and off, and for specifying how much memory you want to allot to the spooler. It works only with parallel printers, and prints only files that use the ROM printer driver routines.

You can use RAMSPOOL to LPRINT or LLIST a program from Basic, send disk directories to the printer, or print files from DOS. While RAMSPOOL is printing, you can use your computer to do whatever you want.

Documentation

The documentation consists of only five pages printed on blue paper, and is meant to be inserted into your NEWDOS/80 manual. The documentation is clear, but very little is needed because the programs are so easy to use. Since these programs aren't copy protected, you can copy them to your system disks as needed.

Conclusion

I've used all The NEWDOS/80 Utilities' programs regularly, and have encountered no bugs. I found them a big help in managing my operating system. My only complaint with the package is the cost, \$49.95, which is a third of the price of NEWDOS/80 itself. ■

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Beyond Basic

by John B. Harrell III

★★★★★

BetterBASIC runs on the Tandy 1000 and 1200 (256K) with MS-DOS 2.X, and on the Tandy 2000 (256K) with MS-DOS 2.11.XX. Summit Software Technology, 40 Grove St., Wellesley, MA 02181, 617-235-0729. Programming system \$199; 8087 math module \$99 (Tandy 1200 only); runtime system \$250.

Easy to use: ★★★★★

Good docs: ★★★★★

Bug free: ★★☆☆☆

Does the job: ★★★★★

When I first heard of BetterBASIC, I thought it was just another product attempting to ride the coattails of Microsoft Basic. As it turns out, BetterBASIC is far more than that. Not only does it contain the rich and robust features of Microsoft's interpreter, it adds many others. You could say that this is a completely new language, derived from GW-Basic but with the completeness of Pascal or C.

BetterBASIC compiles your source code to p-code, an interpretive pseudo-code. It also provides a highly structured, extensible (define your own key words) language. The programming system can use all of your computer's memory (640K on the Tandy 1000/1200, 768K on the 2000), unlike Microsoft's interpreter which is limited to 64K. And, you can develop separately compiled procedures and modules for inclusion in a subroutine library.

With all of BetterBASIC's features, you would think it would deviate significantly from standard Basic. But this system's base level was designed around Microsoft's Basic and is virtually identical to it.

Starting Out

While BetterBASIC comes with a lot of documentation, Summit Software has done a superb job of writing it in plain English. This is the easiest language manual I've ever read.

BetterBASIC's system comprises different modules (see Fig. 5). You use a configuration file to select program modules and other parameters of interest. After I loaded all the standard modules, I was surprised to see I had only 60K of program space available on my 256K Tandy 2000; on my 512K IBM PC XT, I had 280K of program space.

To become more familiar with BetterBASIC, I converted a large Pascal program (a cribbage game with graphics). The resultant BetterBASIC program took up 1,500 lines of code and didn't contain a single GOTO or GOSUB statement. The code is clear, easy to read, and the modularity makes it almost self-documenting.

The System

BetterBASIC checks and compiles each program line as you enter it, providing an immediate response if you make a syntax error. The error message indicates the part of the statement where the error occurred and provides a clear message pinpointing the problem.

BetterBASIC supports record and pointer data types, full block structuring, separate procedures and functions, procedure/function arguments with optional values, local variables and line numbers, recursion, separately compiled modules, and language extensibility.

Two advanced features enhance the way BetterBASIC lets you develop procedures. First, you can use key word arguments, meaning that you must use a word as an argument. You can't pass data value with this word: It simply must be present. Key word arguments can have more than one value and the presence of a particular word is determined from the numerical value assigned to the argument when you invoke the procedure.

Second, BetterBASIC lets you develop procedure families—procedures whose functions are closely related. Each of these independent procedures has the same name but carries a different extension. When you use the root name, BetterBASIC matches the arguments to one of the members of the family, then invokes the procedure.

Other Features

Another BetterBASIC feature is its windowing capability. You can have up to four windows active on the screen at once. You define the windows with a simple command; another command frames the window and a third supports titles. You can do all of this in full color, using up to eight colors at once without ever using a graphics statement.

The programming system also supports interrupts; you can intercept function keys, the system clock, and so on with an internal interrupt mechanism. BetterBASIC checks this pseudo-interrupt after each program line. These interrupts invoke special interrupt procedures to handle the proper actions.

BetterBASIC includes an advanced program chaining and overlay manager. For example, you can call a program segment as a subroutine and then return to the main program, resuming execution at the proper location.

BetterBASIC supports MS-DOS 2.X file structures. All Basic commands can use full path names to address files on the disks. Additionally, the Files module contains commands that let BetterBASIC add, change, or remove directories just as you would from the DOS command level.

Another optional load module provides

full support for making operating system or Basic input/output system (BIOS) calls from within the programming system. The SYSCALL command triggers the software interrupt identified by the parameter.

Specially defined external variables in the module provide full access to the computer's internal registers prior to and after the system call. This includes full access to the central processing unit's flag register, used by many functions to return the completion status of a system call.

Runtime System

The runtime system converts programs prepared with BetterBASIC into stand-alone programs. According to Summit Software, you can sell (or give) these .EXE files to people who don't have a copy of BetterBASIC without regard to royalty payments.

Instructions for creating a stand-alone module are simple and clearly indicated. The resultant programs aren't small. For example, the program I wrote was an ASCII text file of 35K. When compiled, it grew to 43K, and when converted to stand-alone, it was 78K.

Math.BCD. Decimal floating-point arithmetic module. Supports variable-precision floating-point arithmetic, each procedure (module) can declare a different precision.

Console.TDY. Supports the console and display functions. This module also supports BetterBASIC's windowing features.

Main. Supports several BetterBASIC statements and should be a part of each load configuration.

File.DOS. Supports the file system for BetterBASIC, including MS-DOS 2.X path names and subdirectories.

Graphics.TDY. Supports the high-resolution graphics adapter. Windows don't require graphics, but if you have the capability, you should include it in the configuration.

Play.TDY. Supports statements to generate musical notes on the internal speaker.

Event.TDY. Supports event-driven interrupt functions such as the On Key statement and timer interrupts.

Chain.MOD. Supports the chain and call procedures to chain and overlay program modules.

SYSCALL.MOD. Provides support for BIOS and DOS calls with a direct interrupt interface to the system and access to the content of each register. This module also supports the Shell command so you can call the MS-DOS command interpreter.

Figure 5. BetterBASIC system modules.

Evaluating BetterBASIC

BetterBASIC isn't an interpreter, but you really can't consider it a true compiler. Unlike a compiler such as Pascal, BetterBASIC provides an exceptionally simple user environment, just like the standard interpreter system. What's more, the line-by-line compilation with syntax checking is invaluable in detecting program errors early.

I didn't expect its performance to even approximate that of a fully compiled language. I used a Sieve of Eratosthenes prime number program written in BetterBASIC. The Microsoft Basic interpreter performed one iteration in 67.3 seconds, while BetterBASIC executed one iteration in 12.9 seconds. By comparison, Microsoft Pascal executed 10 iterations in 4.3 seconds.

Disadvantages

As with any program this large and new, there are bound to be things wrong with it. Different bugs have shown up in the soft keys and in the windowing functions. But Summit has fixed them in version 1.1.

I had a hard time adapting some of my Basic graphics programs to BetterBASIC. The system initially defines two windows on the video screen: lines 1-24 for text and line 25 for status information. Several of the programs I tried to convert directly used the entire screen as a graphics display area. What I didn't know was that the system clips graphics to fit the selected window.

Another peeve with the system is the error messages the runtime support system generates.

Many Microsoft programmers have become sloppy about using the end of the current line to terminate the open string. The compiler is unforgiving about the proper termination of strings, and this is guaranteed to give you a compile error almost every time.

Conclusion

After using many different compilers and interpreters and more languages than you can count, I don't easily advocate changing from Microsoft Basic. It's an easy language for beginners and generally performs well. But, it has major shortfalls.

One of its worst features is the rat's nest of GOTOs and GOSUBs many programs require. It's difficult to read one of these programs, because the logic flow is almost impossible to decipher.

BetterBASIC is your answer if these problems sound familiar. The system is a treat. I even forgot that I was using BetterBASIC, it's that similar to Microsoft's interpreter. At the same time, it has so many unique features that it qualifies for a position of its own, and a lofty one at that. ■

Almost Super For the Model 4 by Mark Goodwin

★★★★

Super runs on the Model 4/4P (64K). It requires two disk drives. Scientific Analysis, 36 E. Baltimore Pike, Media, PA 19063. \$199.

Easy to use: ★★★★★

Good docs: ★★★★★

Bug free: ★★★★★

Does the job: ★★★★★

Super is a reasonably priced data base manager for the Model 4 that offers sophisticated features like screened data entry and editing, posted transactions between data bases, arithmetic calculations within individual records, and fast multi-level sorting. It holds a maximum of 64K of records, and access time is fast, a matter of seconds for a fully configured data base.

While Super is a good Model 4 data base, it has weaknesses. It was originally written for older Radio Shack computers and the authors make only a bare-bones attempt at using the Model 4's advanced capabilities. And Super doesn't work with any TRS-DOS 6.X high-memory drivers or filters.

Additionally, a more machine-specific version would give Super cosmetically better displays and data-entry screens. Had it been tailored more to the 4, with the ability to format reports for custom forms, Super really would be super.

Super also comes in a Model 1000/1200 version, but I tested only the Model 4/4P version.

Initializing the Data Base

Since Super is completely menu driven, it's easy to use. You initialize the data base by specifying how Super should partition the records into fields. Each record can store up to 255 bytes of data and you can split the records into as many as 40 different fields. In addition, you can vary the individual fields in length and type. In all, Super allows 21 different field types: three alphanumeric, 14 numeric, three special-purpose, and one of byte codes.

After specifying field lengths and types, you design the data-entry screen. Although Super imposes a limit of only one data-entry screen per data base, I think you'll find that sufficient for most purposes. You design a data-entry screen by positioning the cursor at a field's desired screen location and pressing the enter key, repeating this process until you select all the field positions you need.

Manipulating Records

Super's Add mode lets you add records to the data base. One of the Add mode's features is production input, which lets you select fields Super will carry over to

succeeding entries. For example, when you specify a mailing list's state as a production input field, you only have to fill in the state for the first entry. Thereafter, Super carries that information over to the next entry. Super automatically enters the same information until the end of the data entry session or until you change a production input field's contents.

You can search the data base to display, edit, or delete records in three ways: by record number, by specifiers, or by binary search. While searching directly by record number provides the fastest response, you won't know a record's number most of the time. Therefore, searching by specifier or the binary search are usually preferable.

Searching by specifiers permits relational searches, substring searches, range searches, and code searches. While Super's searching by specifiers is a powerful feature, it could be improved by allowing wildcard characters.

Binary searches can be an extremely quick method for extracting records from a sorted data base, but they will usually fail on unsorted data bases.

Super's report generator provides several different report formats. You can display and print data horizontally, print mailing labels, or print records as they appear on the data-entry screen. Horizontally formatted reports permit selection of specific fields, titles, headers, subtotals, and totals. Optionally, you can save horizontal report formats to disk for future use. Printing mailing labels is restricted to one-up mail labels only.

Super's sort routine is fast. You can sort an entire data base to any level by specifying the appropriate sort keys. Any field within the data base qualifies as primary and secondary sort keys. Super sorts small data bases that don't exceed memory limits quickly in memory. Sorting large data bases takes longer because of the required disk accesses.

The Documentation

Super's manual is quite good at providing a working knowledge of the software, but it never explains how to transfer the program files to a TRSDOS 6.X system disk. Transferring program files between disks should be an easy task for experienced users, but novices may find the lack of information a major deficiency.

However, the manual is written for the Model I, the Model II/16, the Model III, and the CP/M versions of Super. The only Model 4 documentation provided with Super is a one-page supplement.

Conclusion

Super isn't the be-all of Model 4 data bases—in fact, Super and its documentation don't serve the Model 4 user as well as they could. ■

Continued on p. 113

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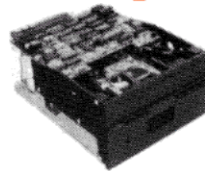
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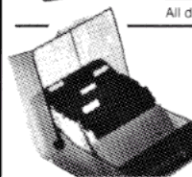


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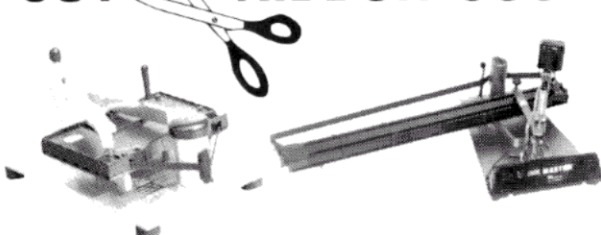
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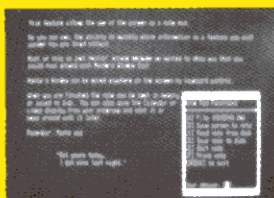


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A compendium of
advice, tricks, and patches for
Tandy 1000 users at all skill levels.

THE TANDY 1000 TIP SHEET

As an *80 Micro* technical editor, I've covered the Tandy 1000 since it first came out. I use it every day, testing PC software compatibility, converting Model III/4 software, and playing with its DOS and Basic.

I kept notes of discoveries I made on the 1000's idiosyncracies, read Tandy's advance material (and asked them lots of questions), tapped CompuServe's 1000/1200 special-interest group (SIG), and talked to *80 Micro* readers. I ended up with a hodge-podge of information and advice about the 1000 that I'll present here. Some of this might be old hat to experienced users, but everyone, from the novice to the veteran, should find some useful tips.

DOS Prep

Your Model 1000 DOS offers a number

of files that can make your system easier to use. To improve your 1000's operation and PC compatibility, you should create two files, CONFIG.SYS and AUTO-EXEC.BAT, on your DOS boot-up disks.

► MS-DOS looks for CONFIG.SYS on boot-up before it displays the date and time prompts. You can write this file to set the number of buffers available for disk input/output (I/O) and the number of files MS-DOS opens simultaneously.

If you don't create CONFIG.SYS, MS-DOS uses its default values: two buffers, eight files, and so on. However, you should set the number of buffers higher than two to speed up programs with lots of file I/O.

► You can also use CONFIG.SYS to specify device drivers, such as the two keyboard drivers (ANSI.SYS and KEYCNVRT.SYS) that come with the 1000's DOS (see below).

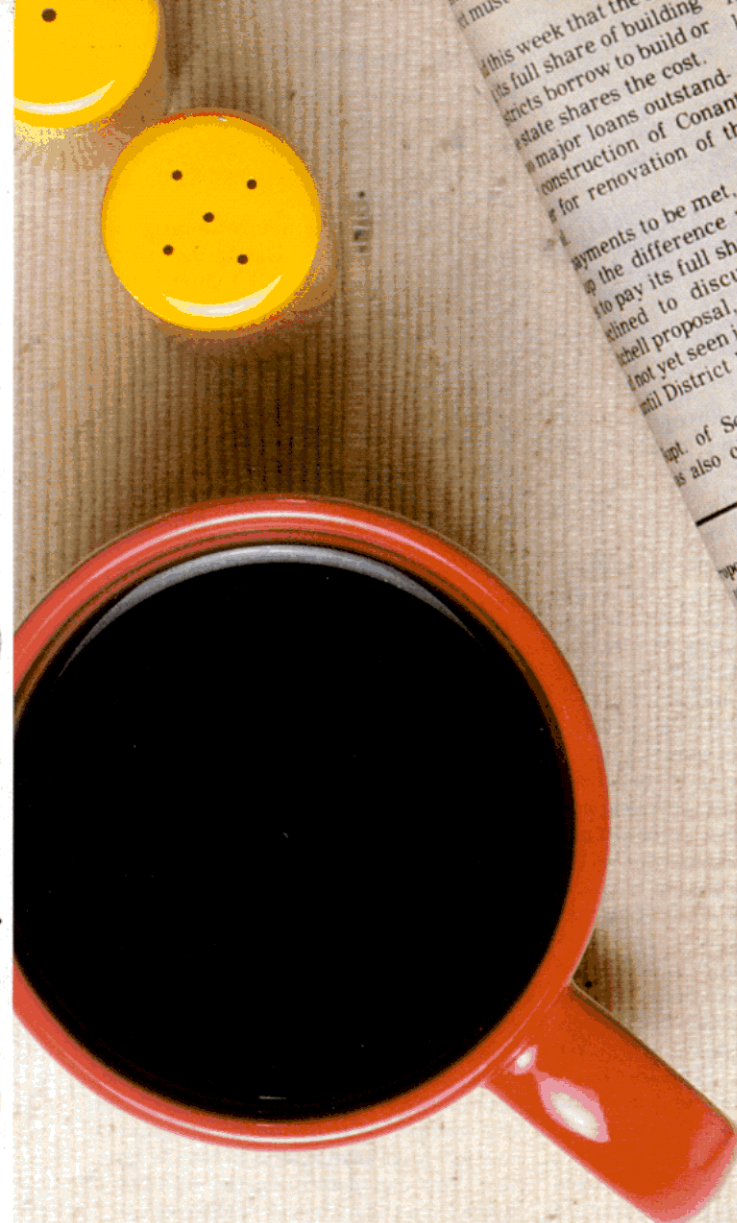
CONFIG.SYS is an ASCII file you can create with DeskMate's Text program or another word processor; just type in each parameter on a separate line and save the file as CONFIG.SYS. For example:

```
BUFFERS=6  
FILES=10
```

sets aside six buffers and opens 10 files.

► Reserving more buffers speeds up disk I/O, but at the expense of some memory. Each buffer takes 528 bytes of RAM. If you haven't got much memory to spare, configuring a large number of buffers slows down some programs. Some commercial software packages come with instructions for setting files and buffers for optimal operation.

► Your DOS's ANSI.SYS and KEYCNVRT.SYS keyboard drivers can make the 1000



by Dave Rowell

more compatible with some IBM software. To install a driver, add a line to CONFIG.SYS such as:

```
DEVICE = ANSI.SYS.
```

ANSI.SYS defines the display and keyboard according to American National Standards Institute (ANSI) conventions; it also slows video display somewhat. PC-DOS provides this driver, too.

KEYCNVRT.SYS redefines the 1000 keyboard so that it behaves more like the PC's (more on keyboard compatibility later).

► AUTOEXEC.BAT is a batch file, that is, a job control language (JCL) file like that TRSDOS 6.X's Do file creates. After executing CONFIG.SYS, MS-DOS looks for and executes AUTOEXEC if it exists. You can use it to set up subdirectories or

change the default drive for an application that uses a data disk in drive B.

Figure 1 shows my DOS disk's AUTOEXEC file. It puts the 1000 in color mode (it normally boots in black and white) and sets up the printer driver so it doesn't send a line feed with carriage returns. The printers here at 80 Micro add their own line feeds (the Radio Shack standard), so this way I avoid unwanted double spacing without setting and resetting DIP switches every time I print.

Batch files are ASCII files. You can type them in using a text editor, or you can use MS-DOS's standardized I/O capabilities to write short batch files, as shown in Fig. 1.

► The Copy command, usually used to copy files from one disk to another, actually copies files from one device to another. In this case, you can use it to copy

a batch file from the keyboard (device CON:) to disk.

When you type in COPY CON: AUTOEXEC.BAT and press the enter key, MS-DOS copies all subsequent keyboard input to a file called AUTOEXEC.BAT until you press control-Z (or F6) and the enter key. If the file doesn't yet exist, the DOS creates it.

► If answering date and time prompts annoys you, build an AUTOEXEC file without Date and Time. You won't see them again.

► When you run programs written for the IBM PC on your 1000, you'll find that

TANDY 1000 CONFIDENTIAL



Over 50 Sure-Fire Tips for Better Computing

By DAVE ROWELL

I've covered the Tandy 1000 since it came out. I've ended up with a hodge-podge of information and advice. Some of this might be old hat to experienced users, but everyone, from the novice to the veteran, should find some useful tips.

• Your DOS's ANSI.SYS KEYCONVRT.SYS keyboard ers can make the 1000 mor

Page 3

Surprisingly, invoking the 1000's color mode improves the display on monochrome monitors.

and others, who a ... running ... Two write-in candidates

many boot up in black and white unless you set the mode for color. Surprisingly, color mode also improves the display on monochrome monitors; you get full intensity instead of the half intensity some applications display.

► You can incorporate an Echo statement in batch files to display messages or prompts relevant to the execution of a batch file. For example:

```
ECHO OFF
ECHO .
ECHO Place data disk in drive B.
ECHO .
```

displays a message telling you to put a disk in drive B. Echo Off prevents the display of subsequent batch commands except for text following an Echo statement (as above).

Echo followed by a period is a sneaky way to skip a line for a more pleasing appearance. It does add time to batch file processing, however.

Don't use less-than or greater-than symbols (< or >) in Echo commands. MS-DOS interprets them as indicating I/O redirection and produces an error message or worse.

► In batch files that change the default drive from A and then load an application program, add a final command changing the drive back to A. Otherwise, you might aggravate yourself by wrongly assuming drive A is the default drive when you leave the application. When the 1000 finishes executing your program, you'll see the A> prompt again. Here's a sample batch file—call it SUPER.BAT—that loads Supertext, a fictitious word processor:

```
ECHO OFF      REM turn off echoing of com-
               mands
B:             REM Supertext stores text
               files on B:
A: SUPERTEXT  REM load Supertext
A:            REM change default back to
               drive A
```

The second command could just as well call a subdirectory where you store your application's data. When you specify a subdirectory, use the full path name; for example, B SUPERDATA. Don't assume the drive B default directory is the root or you may get an error message. Some previous application may have left you off in a subdirectory of a subdirectory, and your batch file won't find Superdata. I learned the hard way.

► MS-DOS provides a variety of JCL statements you can use in batch files, includ-

ing conditional jumps and parameter shifts to allow consecutive processing of files in a loop.

Exploring EDLIN

► You'll often want to modify an existing batch file or change a device driver in the CONFIG.SYS file. You could load up your word processor, but that's a lot of bother for such a small file. Using EDLIN, MS-DOS's text processor, is quicker and simpler.

It takes only five of EDLIN's one-letter commands to do what you want: L (to list a file), I (to insert new code), D (to delete old code), Q (to quit and ignore all changes), and E (to exit and update the file). You must precede an Insert or Delete command with the line number you want to act on; typing in 4D deletes line 4. To edit an existing line, type in its number.

► Here's how to use EDLIN to install the KEYCNVRT.SYS keyboard driver in your CONFIG.SYS file so you can use an IBM PC program with minor board incompatibility, like ThinkTank. Type in EDLIN CONFIG.SYS. The text editor loads, and in turn loads CONFIG.SYS.

At EDLIN's asterisk prompt, press the L key and the enter key to list the file. In this case, the file is two lines long. To add a third line type in 3I and press the enter key. Type in the new line: DEVICE = KEYCNVRT.SYS and press the enter key. Press control-C to leave the insert mode, then press the E key to exit EDLIN and save the changes.

► Use the function keys to save keystrokes when typing in DOS, EDLIN, or Debug commands. I use F2 and F3 more than the others, usually to recover gracefully from a mistake. F3 repeats the last command you entered, which MS-DOS stores in a buffer (similar to L in TRS-DOS's Basic editor).

Pressing F2 followed by a character repeats your last command up to that character. Assume, for example, you typed in EDWIN AUTOEXEC.BAT and got a "Bad command" or "File name error" message. To correct your command line, press F2 and W. The computer displays "ED". Type in L to replace the offending W, then press F3 and when the rest of the command appears, press the enter key.

It took only five keystrokes to correct EDWIN AUTOEXEC.BAT; retyping would have taken 19 keystrokes. The Insert and Delete keys also work logically with the function keys.

Debug Session

► Debug is the assembling debugger that comes on your DOS disk. It's not at all powerful as an assembler, but it's useful for writing small machine-language programs or patches.

Figure 2 shows a machine-language program I'll use as a Debug demonstration. The program, called Query.COM, adds an important capability to your batch files: It accepts keyboard input as the batch file executes to make conditional branches. It tests only for a yes/no answer, but it's an ability I've always thought sorely lacking from MS-DOS's job control language. If you press Y or y, the computer sets an error code 1, one of the conditions you can test with an If...GOTO statement.

To create Query.COM, refer to Fig. 2 as you follow these steps. Type in DEBUG. Type in N and the program's name (Query.COM). Press the A key to begin assembly. The computer displays an eight-digit memory location where assembly begins (XXXX:0100). The four numbers before the colon vary; the number after the colon is always 0100. Complete this line as shown in Fig. 2 and press the enter key. Another memory location (XXXX:0102) will appear. Complete the instruction lines through memory location XXXX:0120, ignoring the comments following the semicolons. At location XXXX:0120 press either control-C or the enter key to end assembly.

Type in R CX to view and alter the CX register contents. The computer displays the current contents followed by a colon prompt. To enter a new value, type in 20, the number of bytes in the program in hexadecimal format, and press the enter key. You can determine the number of bytes from the instruction addresses.

Press the W key to write the 20 bytes starting at offset 0100. Debug saves the code you entered to the new file Query.COM. You now have a usable program. Press the Q key to return to DOS.

► You can use Query.COM in your batch files to let users select program options. Figure 3, for example, shows an AUTOEXEC file that loads a program called File used with a hard disk system. Anyone who doesn't want to load File can bail out of the AUTOEXEC sequence by pressing the N key at the prompt.

► The DOS program More.COM filters output to the video display so that it pauses every 23 lines (one screen) until you press the enter key. To display the ASCII file Text.ASC on the screen with pausing, type in TEXT.ASC|MORE. The | symbol pipes the Type command's output through the More.COM filter before screen display, adding pauses.

► Bob Spencer of Truckee, CA, has a patch to More.COM that lets you send an ASCII file to the printer with a pause after every page. Use Debug to install this patch (see Fig. 4).

First, make a new copy of More.COM un-

der the name PMORE.COM by typing in COPY MORE.COM PMORE.COM. Type in DEBUG PMORE.COM. At the Debug prompt (a hyphen), enter a new value at memory offset 01D8 by typing in E 01D8. The computer displays the full memory address followed by the current contents (18) and a period. Type in 36 and press the enter key. You have changed the pause length from 24 decimal (one screen) to 54 decimal (one printer page). The length is actually this number minus 1. You can set this number as you like.

You can blank out the "-MORE-" message with nulls so it doesn't print out. Type in, at the next prompt, F 01E1 01EA 00. This command fills the message memory locations (offset 01E1-01EA) with zeros. Save the altered program to disk by pressing the W key, then leave Debug by pressing the Q key.

To use the patched PMORE.COM to print the file Text.ASC, type in TYPE TEXT.ASC | PMORE > LPT1. The > symbol replaces the standard output, your display screen, with your printer (LPT1 here).

DOS Miscellany

► Tandy's Disktype DOS utility comes in handy when you back up applications disks. The Back-up command requires that your destination disk have the same format as your source disk. Disktype analyzes a disk and displays its format, along with the syntax of the Format command you need to prepare the back-up disk.

► When MS-DOS tries to access a disk and the drive door is open, it returns a "Not ready error reading drive X" and prompts you to abort, retry, or ignore. Usually you close the offending latch and press the R key to continue what you were doing. Applications software exhibits this same tendency if it uses DOS routines, but sometimes the message and prompt don't show on the screen because of a program's use of graphics.

This happened to me one day; the open drive spun for a while and the program hung up with no change on the screen. I closed the drive door and pressed what I thought were appropriate keys, but got no response. On a hunch, I pressed the R key (for Retry). The program came to life, loaded the file, and I was forgiven.

► With IBM's PC-DOS, you can use the Mode command to direct all printer output to a serial port. MS-DOS 2.11, the first version of the 1000's DOS, doesn't include this feature, but it's on the new release, which should be out now.

A Little GW-Basic

The 1000's GW-Basic isn't as different from TRSDOS Basic as you might think. The biggest changes involve graphics and GW's full-screen editor (see "The GW Difference," February 1985, p. 42). Besides the printing bug mentioned in the sidebar, I've found a few things worth passing on.

► While...Wend is a control structure new to most Model V/III users. As long as the con-

```
A>COPY CON: AUTOEXEC.BAT
ECHO OFF      REM Batch file commands won't show
DATE          REM Adds the date prompt
TIME          REM Adds the time prompt
MODE CO       REM Color mode
LP            REM Invokes LP.COM which patches MODE
MODE LFOFF    REM Eliminates linefeed with carriage-return
^Z            REM CTRL-Z ends input
A>
```

Figure 1. Sample AUTOEXEC batch file.

```
A>DEBUG
-N QUERY.COM      ;Enter Debug
-A               ;specify program name
                ;begin assembly
XXXX:0100 MOV AH,1
XXXX:0102 INT 21   ;get keyboard input
XXXX:0104 CMP AL,79 ;is it ASCII for Y?
XXXX:0106 JE 116    ;then YES
XXXX:0108 CMP AL,59 ;is it y?
XXXX:010A JE 116    ;then YES
XXXX:010C CMP AL,6E ;is it N?
XXXX:010E JE 11A    ;then NO
XXXX:0110 CMP AL,4E ;is it n?
XXXX:0112 JE 11A    ;then NO
XXXX:0114 JMP 100    ;if not Y/N then again
XXXX:0116 MOV AL,01  ;YES: return error level 1
XXXX:0118 JMP 11C    ;jump to END
XXXX:011A MOV AL,00  ;NO: return no error
XXXX:011C MOV AH,4C  ;END: set to leave
XXXX:011E INT 21     ;back to DOS
XXXX:0120 ^C         ;Ctrl-C ends assemble mode
-R CX               ;display and change contents of
CX 0000             ;CX register to number of bytes
:20                 ;in the program (20 hexadecimal)
-W                 ;write the program to disk
Writing 0020 bytes
-Q                 ;quit Debug; you're done
A>
```

Figure 2. Using Debug to create a machine-language program.

```
ECHO OFF
DATE
ECHO Do you want to use File (Y/N)?
QUERY          REM QUERY.COM gets reply
IF ERRORLEVEL 1 GOTO YES REM and sets error if yes
GOTO NO        REM Otherwise skips over
:YES           REM yes action
ECHO Insert File program disk in A:
ECHO and close drive.
PAUSE          REM waits for enter key
CD C:\FILE     REM to File data subdir.
A:FILE         REM Run application
CD C:\         REM Back to root dir.
:NO            REM Continue on-no action.
```

Figure 3. Adding query capability to batch files.

```
A>COPY MORE.COM PMORE.COM
1 File(s) copied

A>DEBUG PMORE.COM
-E 01D8          ;replace the 18 at offset 01D8
XXXX:01D8 18.36 ; with 36 (54 decimal)
-F 01E1 01EA 00 ;blank out MORE message
-W              ;write patched program to disk
Writing 110C bytes
-Q
A>
```

Figure 4. Patch to add pausing to printer output.

the check
trustee. There was usually always election of the

Type in KEY ON: KEY OFF to clear the screen's 25th line.

Jaffrey, and other towns have seen er. If he does not, the
interest. ferred to the writer

Fit to Print

by Dave Rowell

When it comes to using your printer with the Model 1000, you should encounter only minor problems unless you stray too far from the Tandy trail. Radio Shack's computers and printer drivers assume that a printer generates its own line feed whenever it receives a carriage return. IBM computers (and others) let the software decide when to send a line feed. The 1000 happens to be PC-compatible in this respect; you must set a switch on your Radio Shack printer to prevent it from generating extra line feeds.

If you have an older Radio Shack printer without a line feed switch, you're still OK if you set up an AUTOEXEC batch file that executes the programs LF.COM and MODE.COM (with the LFOFF parameter). To do so, run the 1000's LPIINST program and answer the query about your printer. This utility creates an AUTOEXEC.BAT file with the appropriate commands. If you've already written such a file, the utility modifies it.

If you have an Epson printer, your troubles may be more than minor. Roy Cartier of Winchester, VA, found that some Centronics-type 1000 printer cables, including Tandy's, use pin 14. Input from the 1000 to this pin (unassigned on Epson printers) causes extra line feeds. Either cut this line—count 14 from the colored edge of the cable, slit along each side of the wire, pull it out, and snip it—or buy a cable from Epson.

Another problem with Epson printers arises when you try to dump high-resolution graphics to your printer by pressing the shift and print keys simultaneously. The 1000's Graphics.COM program supports screen dumps of high-resolution graphics, but only for Radio Shack's CGP-220.

Some 1000 owners have tried using PC-DOS's Graphics.COM program, written for Epson printers. The resulting dump prints out double-spaced and none of the techniques discussed above seem to help. Modifying the program is the solution. The patch in Fig. 5 eliminates the extra line feed from Graphics.COM. Graphics.COM works only in the display's two-color high-resolution mode (mode 2), however. Be sure to apply the patch to a back-up of Graphics.COM in case you goof.

Tandy says the 1000's DOS upgrade will handle Radio Shack's DMP line of printers, and possibly non-Tandy printers.

GW-Basic's LPRINT and LLIST commands exhibit a different, but solveable, bug: If you try to send lines longer than 80 characters to the printer, the 1000 displays an out-of-paper or a device-timeout message. The undocumented solution is to type in WIDTH LPRINT 255 before you invoke the list or print commands, or add the width statement to your program.

Tandy reports that Okidata's Microline 80 printer can damage the 1000's printer port due to high voltage on pin 34. You can get a fix that won't affect the port's function at Radio Shack Computer Centers. ■

```
A>COPY GRAPHICS.COM EPSGRAPH.COM
      1 File(s) copied
```

```
A>DEBUG EPSGRAPH.COM
-E 02F7 90 90 90
-W
Writing 0315 bytes
-Q
```

```
A>
```

Figure 5. Patch to PC-DOS's Graphics.COM to eliminate extra line feeds.

dition following the While statement remains true, the program repeats executing all code up to the next Wend statement (endlessly if you're not careful).

I used to wonder about the value of this structure until I saw it used in this INKEY\$ routine:

```
100 PRINT "Press any key to continue."
110 WHILE INKEY$ = "" : WEND
```

It's more intuitive than the I/III's If...Then...GOTO structure and is independent of line numbers, which doesn't matter in this case, but would if several lines of code preceded the Wend.

► In some cases, it's nice that GW-Basic's CLS command doesn't clear the screen's 25th line. However, when your misguided graphics program plots on the bottom line and you want to clear the whole screen, it's aggravating. At 80 Micro, we've come up with two solutions. The easiest is to type in KEY ON:KEY OFF. Use this in the command mode; it doesn't make for professional-looking programs, as the function key assignments flash on and off briefly, but it's functional.

The second method uses the Line command's filled-box form. Essentially you fill the 25th line with a solid rectangle of the background color. You must calculate the proper coordinates for the graphics mode you're in, then fill the resulting box with the proper color. It's much quicker to clear the screen and box out the 25th line than to box out the whole screen.

For graphics mode 1 with a black background, use LINE (0,192)-(639,199),0,BF. The last line clears rather slowly, but it works. This routine doesn't work in screen mode zero, but you don't need it then. The Locate statement won't touch the 25th line.

► When using the new graphics modes 5 and 6 (found on the PCjr and the 1000), you must double the RAM allocated for video from the 16K default to 32K by typing in CLEAR...32768. (The PC provides 16K of video RAM on the controller card exclusive of user RAM.)

► If you embed machine-language subroutines in Basic programs, use the Call statement, especially if you're passing several variables. It's similar to the Model 4's Call command, except that the 1000 stores the passed variables' addresses on the stack.

► Model III users may feel more comfortable with the 1000's USR statement. Beware of the Basic manual, however. To return to Basic from your 8088 subroutine, use a simple Far Return command (RETF), not RET 7 as the manual states. I had to reboot my 1000 repeatedly until I consulted the IBM manual and got it right.

► Also, if you're used to pointing to a contiguous block of integer variables stored 5 bytes apart, the separation is now 6 bytes because variable names are longer. But keep the variable names to two characters or the separation will be more than 6 bytes.

► You can use Debug in a roundabout way to trace machine-language subroutines in your Basic programs. Load and run Ba-

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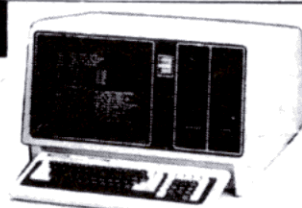
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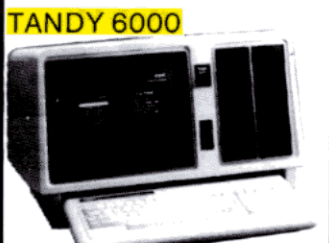
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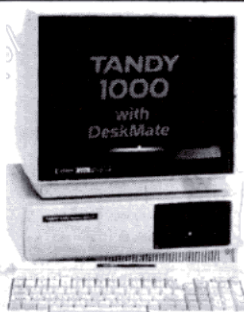


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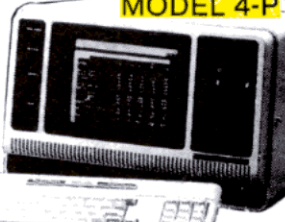
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sic.EXE from within Debug, then run your Basic program. However, it's hard (maybe impossible) to set a breakpoint at your 8088 subroutine because you can't predict where Basic's data segment (DS) will start in memory.

By dumb luck, I found that starting Basic with a breakpoint set at offset 1020 (G 1020) makes it break at the first INPUT\$ statement encountered in a program. You can then see DS's contents and use the Trace command to single-step through your subroutine. Put the first INPUT\$ statement after any code setting up data for the subroutine. When Basic loads, you'll see an error message, but ignore it and run your program.

DeskMate Details

Tandy has fixed some bugs in and made some improvements to the new version of DeskMate (version 1.1); it's available free as an upgrade. Here are some ideas you can use with either version.

► If you use DeskMate with a VM-2 monochrome monitor and the screen seems dim or lacks contrast, change the tint using the function keys as explained on p. 25 of the *DeskMate Tutorial*.

► Noisy phone lines can disconnect the Tandy 300-baud modem before it picks up a carrier signal. Tandy suggests adding some Pause commands (P) when you dial, like so: 1-800-123-4567PP. This gives the telephone line time to stabilize before the modem checks for the carrier.

► To use automatic dialing from DeskMate with Tandy's 300-baud modem, you must program the modem every time you get on the system, since the default is manual dialing. Chris Murphy of Baltimore, MD, suggests setting up an auto-log file in Telecom like the one below. Call it something like SYSINIT.LOG and have it dial your own number (no phone bill):

```
NUMBER: *MDT123-4567X
```

The asterisk opens the modem for programming, M toggles the modem from manual to automatic dialing, DT sets the modem for tone dialing (if appropriate), 123-4567 is your phone number, and X tells the modem to execute the command.

If this is the first call you make, the modem will be set for autodialing the rest of the session.

► To set up Telecom for voice dialing with-

out turning on the modem, change your voice dial definition to this:

```
SEND: *C*GM*\DT
RECEIVE: T
NUMBER
SEND: PPX
RECEIVE: X
PAUSE: 2
SEND: *
```

► Did you ever want to use DeskMate on an IBM PC, Tandy 1200, or other PC-compatible computer with only 10 function keys? Here's a DeskMate modification to do just that (stolen from CompuServe's 1000/1200 SIG). You need a disk-editing program to change 2 bytes in Desk.EXE, DeskMate's main program. Unfortunately, you can't fix this with Debug because it can't handle .EXE programs.

Change memory locations 0BCC and 0BCD from 98 and 99 (keyboard scan codes for F11 and F12) to 70 and 71 (ALT-F9 and ALT-F10). To find these locations, look near the end of the sixth file sector for the table of function key scan codes. ALT-F9 now shows the auxiliary functions and ALT-F10 becomes the exit key. DeskMate requires a color graphics board on a 1200 or an IBM PC.

Repair Service

► Everyone knows the value of backing up important disks. You should also run CHKDSK periodically on the disks you use most. This DOS utility checks for errors in disk space allocation, and can do some minor repairs. Use it regularly to stamp out disk problems before they grow into catastrophes.

► When a disk has damage that CHKDSK

can't handle, another DOS utility, Recover, might be able to pull some of your data out of the fire.

► If you're an old TRS-80 user, Super Utility Plus might be your favorite security blanket. The MS-DOS equivalent is called The Norton Utilities. It's as close to Super U as you'll get for now. It doesn't do a lot of the things Super U does, but in many cases it doesn't have to, because of the compatibility among different versions of MS-DOS.

The NU also does things that Super U doesn't, and it's easier to use because it's aimed at a more business-oriented market. NU has what you need to recover lost data and edit files. However, one thing Norton doesn't offer is the ability to copy protected software.

► Beware of leaning disks against the front of your 1000. The speaker magnets are directly behind the front of the plastic case. I haven't heard of any problems so far, but you never know.

Board Room

You'll find expansion boards out there fewer than 10 inches long that work in the 1000. Tandy claims that any PC-compatible board will work. So far, I haven't heard any contradiction to this. The selection isn't great, but more short boards will become available thanks to the IBM Portable PC, which has slots even shorter than the 1000's.

► Tandy has changed the way expansion boards mechanically attach to the back panel to improve grounding. You can easily modify boards intended for the PC to fit in the 1000 by either cutting 1/2 inch from the tab on the board frame's bottom or by bending that tab. I cut the tab on an IBM serial board, and it works fine. However, I did have to buy a gender changer for my RS-232 cable because the IBM port is male, while the Tandy board is female.

Compatibility Questions

The Tandy 1000 is mostly PC-compatible, but not absolutely. A few programs will never run on it because they flagrantly violate MS-DOS conventions. Some other programs will cause problems, but you can get them to run if you take the right steps. I've already men-

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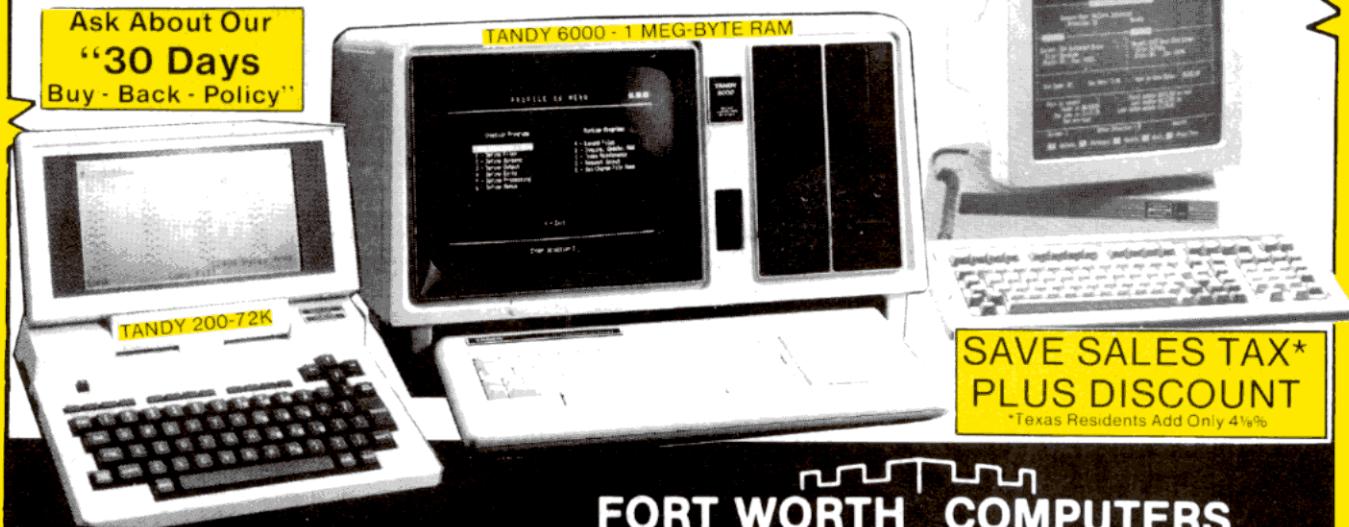
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SEE OUR REVIEW ON PAGE 33.

and others, who are running for re- write-in can

Any of the two-button Color Computer joysticks will work.

list, auditor, or library only one write-in vo n. Most

tioned how to configure the 1000 for color mode and for the keyboard drivers. Here are some other potential problems and suggestions for dealing with them.

►The 1000 requires more of your RAM than the PC, leaving less room for applications. The 1000's MS-DOS is a little larger, and video RAM now resides in user RAM rather than on the video controller board. That costs you 16K of RAM, 32K if you use the newer graphics modes (5 and 6).

►If you use Basic, the squeeze gets worse, because GW-Basic is totally RAM-resident. After loading Basic on a 128K 1000, you have only 18K free.

The solution is to spend more money and upgrade to 256K, for two reasons. You can run larger programs, and with the upgrade you get direct memory access (DMA), which speeds up processing. More important, some software protection

schemes require a DMA chip.

►Some PC software requires that you copy the DOS system files, or at least Command.COM, to the program disk. If a program is copy-protected, you're supposed to use the SYS command to move the system files to the protected disk. But the 1000's SYS command won't work on a disk unless the 1000's DOS formatted it.

Sometimes you can copy the 1000's Command.COM to the application disk, boot up with your DOS, replace it with the protected disk and run the program. You can also buy PC-DOS, which runs fine on the 1000, except for Basic.

►If you run a PC program known to be compatible with your 1000 and see only a blank screen, make sure the program isn't configured for the IBM monochrome monitor.

►Programs written for the PC often use

keys on the PC's numeric keypad that the 1000 lacks. You can simulate the PC's scroll-lock key with control-break on the 1000. If you need the PC keypad's plus or minus keys, you'll have to install the KEY-CNVRT.SYS driver in CONFIG.SYS. Among other things, this driver also makes keypad numbers act as arrow keys.

►The 1000's joystick ports are IBM hardware-compatible but, as a rule, PC software requiring joysticks won't run on the 1000. That's because the joystick routines' software timing loops run at different speeds on the two computers. If you find PC software that does run, or Tandy software that uses joysticks, any of the two-button Color Computer joysticks will work. I recommend the deluxe models with "tabbing." ■

Dave Rowell is an 80 Micro technical editor who specializes in MS-DOS computers. You can write to him at 80 Micro, 80 Pine St., Peterborough, NH 03458.

Related Articles

Heid, Jim. "The GW Difference," February 1985, p. 42. An introduction to GW-Basic for Tandy 1000/1200 owners.

Rowell, Dave. "Tandy Rides Again," April 1985, p. 50. A detailed review of the Tandy 1000.

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EXTRA-STRENGTH

DOS

by Keith E. Risler

Get a punched-up Model III/4 DOS in minutes
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It's no good having tricks up your sleeve if you can't get at them. Logical Systems' Model III LDOS 5.X.X and Tandy's LDOS-based Model 4 TRSDOS 6.X.X offer a number of excellent user-definable features, but it's hard for a beginner to take advantage of them.

The DOS manuals don't help matters. They're full of detail about individual functions, but they don't tell you how to invoke them. In fact, they're almost guaranteed to frustrate first-time users.

Setup (see the Program Listing) gets new owners running a powerfully configured DOS almost immediately. It's a package of advanced LDOS 5.X.X/TRSDOS 6.X.X options that you install on system disks. Setup:

- configures your keyboard to give you up to 26 definable function keys;
- sets up your computer's communication parameters;
- formats printouts;
- turns on TRSDOS 6.X.X's keyboard click option;
- speeds up keyboard response;
- installs DOS overlays in memory for faster execution; and
- (for LDOS only) installs the MINIDOS program, which lets you execute certain DOS commands without being at LDOS Ready.

Experienced users can tailor these options to their own needs. You can run Setup each time you boot up, or you can use it to configure your system disks permanently.

About JCL

Setup is actually a job control language (JCL) file, that is, a series of DOS commands that the computer automatically executes, as if you typed them in from the keyboard.

The simplest way to create JCL files is to use the Build library command in the form BUILD FILE NAME. Then, following the manual's instructions, you type in a list of commands; for example, you can have a JCL file call a directory, display the amount of free space on a disk, and enter Basic.

The computer saves these files with the extension /JCL unless you specify otherwise. To execute a JCL file, type in DO FILE NAME/JCL at DOS Ready.

The Build command has a serious shortcoming, however: You can't edit lines once you've typed them in. To create long files like that in the Listing, you should use a word processor capable of saving text files in ASCII format. This way, you can correct any typing errors you make in entering the JCL file.

If you don't have a word processor that

supports ASCII files, you have a third choice: Raymond E. Wilson's Makedo program, which lets you create and edit JCL files (see "Command Performance," June 1984, p. 62).

The Listing comprises seven sections, one for each DOS option. Setup works as-is under TRSDOS 6.X.X. Comment lines, beginning with a period, contain documentation, including instructions for changes LDOS users must make.

I've listed LDOS-specific commands as comments; LDOS users need only remove the periods to enable these commands. You can disable a line of code by inserting a period at the beginning.

The Listing begins with a % sign and the hexadecimal number 1F, which clears the screen. You can leave out any comment lines except the first one; JCL files must begin with a comment.

Setup's comments instruct LDOS users to add a line before typing in option 1. This

**LOAD
80**

System Requirements

**Model III, LDOS 5.X.X
Model 4, TRSDOS 6.X.X**

installs KI/DVR, a keyboard filter that enables your computer's lowercase mode; also, under LDOS, you must have KI/DVR in place before you use many of Setup's features.

The LDOS command's parameters speed up key repeat and activate the screen print option so you can output a screen display to the printer by pressing the left shift, up-arrow, and asterisk keys simultaneously.

Model 4 owners using LDOS 5.1.4 (in Model III mode) might want to try a longer repeat rate, since your version runs at the Model 4's higher processor speed.

If you've already set KI/DVR, be sure to reset it before you execute the JCL file; otherwise Setup aborts.

Going Over the Options

Option 1 configures the keyboard so you can execute commands or enter strings with only two keystrokes, using the DOS keystroke multiply capability. You assign each of the 26 alphabetic keys a specific command; after running Setup, you can execute these commands by pressing the clear key and the appropriate letter key.

Table 1 lists the commands I chose; you can substitute your own commands, Basic program lines, or any other string of up to 255 characters. A semicolon after a character means the command executes immediately, as if you'd pressed the enter key along with the command keys.

Setup writes your key assignments to disk in a file called Routine/KSM after you've typed in 26 entries. I left three keys unassigned, so I typed in NOT USED to reserve the keys for future use. You can redefine keys later, but you can't expand the file once you've saved to disk.

Option 2 installs a driver that sets the communications line to RS-232C hardware and sets communications parameters. The default values are 300 baud, 7 data bits, 1 stop bit, even parity, and a Break value of control-C.

Option 3, for TRSDOS only, makes your Model 4 produce a clicking sound via its internal speaker whenever you press a key. The sound is barely audible under TRSDOS 6.1.2 and earlier versions; under 6.2, however, the click filter produces a painful screech.

The manual says you can patch the click filter to alter its tone, but it doesn't tell you what values to use. Unless you have the time to test for a workable pitch, I suggest TRSDOS 6.2 users omit the keyboard click option.

Option 4 formats your printouts. Under TRSDOS 6.X.X, the Forms command sets printer parameters. Ordinarily, you have to set the printer filter to the forms filter program before using Forms, but Setup takes care of these preliminaries.

Setup also invokes a Forms command that tells the printer to begin printing 10 spaces from the left edge of the page, print a maximum of 60 characters per line, and indent 17 spaces from the edge of the page (7 spaces from the margin) when word-

wrapping lines longer than 60 characters. You can omit the line containing these parameters; once you've run Setup, you can reformat printouts any time by typing in a Forms command from DOS Ready.

The single command line for LDOS users sets the same printer parameters as the TRSDOS version. LDOS supports a great variety of additional parameters, so you should check your manual to get the most out of this option.

Option 5 provides snappier keyboard response by adjusting the time it takes a key to repeat when you hold it down. It also affects the rate at which a key repeats. LDOS users should ignore this option; the line you type in at the beginning of the Listing does the same thing.

Option 6 loads every possible DOS overlay into high memory. This makes your computer run faster since it reduces disk accesses. LDOS users should add overlay 8.

I've found that these overlays can create problems with programs like SuperScript, so you'll have to test your software to see how many overlays you can safely install. You must put specific overlays in memory to back up a nonsystem disk in drive zero. Under LDOS, be sure to install overlays 2, 3, 8, and 10; under TRSDOS, don't omit overlays 2, 3, and 10.

Option 7, for LDOS only, activates the MINIDOS filter program, which lets you execute certain DOS commands without being at DOS Ready; you do so by pressing the clear and shift keys simultaneously with an alphabetic key. Table 2 lists the keys and the functions they invoke.

To enable option 7, you must delete the period at the beginning of the line of code.

Let's Do It

After you decide which options you want, type in the appropriate parts of Setup and, assuming you're using a word processor, store the text file in ASCII format as Setup/JCL. As I mentioned above, you can also use the Build command or Makedo/BAS.

To configure a system disk, make a copy of your unconfigured master DOS disk. Put this copy in drive zero and boot up to DOS ready. You can either copy Setup/JCL to the unconfigured system disk (necessary if you have only one drive) or run it from drive 1.

A word of caution might save some heartache. If you don't have room on your system disk to store Routine/KSM, you get a "Disk full" error message and Setup aborts. If this happens, remove (kill) Routine/KSM and some of your nonsystem files and try again. You'll also need space to store a SYSGEN configuration file if you decide to configure the disk permanently.

When you're all set, type in DO SETUP/JCL and press the enter key. Setup builds the Routine/KSM file, writes it to disk, and uses that file to configure the keyboard to the alphabetic commands. Then it installs the remaining options you selected.

After you install your DOS features, Setup reminds you that, to make the configuration permanent, you must type in SYSGEN (YES) at TRSDOS Ready or SYSTEM (SYSGEN=ON) at LDOS Ready and press the enter key. Setup doesn't do this automatically because you can't execute SYSGEN from a JCL file.

The "yes" and "on" in the SYSGEN commands above are switches; you can delete the SYSGEN configuration file from your disk using the same commands with "no" or "off" instead.

If you don't SYSGEN, the whole configuration vanishes as soon as you turn off or reset your computer.

Other Options

You can modify Setup to include other options. In its present form, Setup offers most of the definable DOS options users want. It doesn't prevent the print spooler's use under TRSDOS 6.X.X or LDOS 5.X.X and allows full use of Memdisk and the print spooler in any combination on the Model 4.

If you install too many options, however, you may not be able to use Model 4 Memdisk, since the part of low memory it uses may be full. ■

Keith E. Risler is a computer hobbyist who's studying for his master's degree in English at the University of Western Ontario. You can write to him at 80 Adelaide St. S., London, Ontario, Canada N5Z 3K5.

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Key	Definition	Key	Definition
A	DIR :0 (A);	N	NEW;
B	DIR :1 (A);	O	DIR :0 (P);
C	FREE :0;	P	DIR :1 (P);
D	FREE :1;	Q	FREE :0 (P);
E	DEVICE;	R	FREE :1 (P);
F	FORMAT :1 (Q=N);	S	SAVE"
G	BACKUP :0 :1;	T	RUN
H	BACKUP :0 :1 (X);	U	RUN;
I	BACKUP :1 :0 (X);	V	LOAD
J	NOT USED	W	SPOOL *PR (NO);
K	BASIC;	X	NOT USED
L	LIST;	Y	SPOOL (CLEAR);
M	NOT USED	Z	BOOT;

Table 1. Setup's keystroke multiply assignments.

Key	Definition
C	Clock on or off
D	Debug
F	Free
K	Kill
P	Send a character to the printer
Q	Directory
R	Repeat the last DOS command
T	Top of form

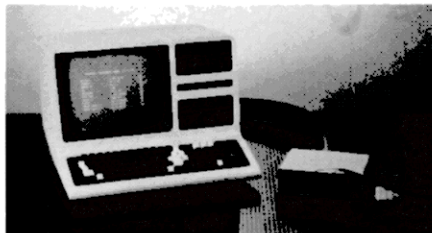
Table 2. MINIDOS commands.

Program Listing. Setup/JCL.

```
%IF.SETUP/JCL-TRSDOS 6/LDOS 5 system disk configuration file
.Copyright (C) 1983, 1984, 1985 Keith E. Risler, M.A.
.All Rights Reserved.
.IMPORTANT: All LDOS 5 features are labelled as such:
. You install them by REMOVING THE PERIOD before the line
. of code AND DELETING other lines as instructed
.Tested and fully functional for LDOS 5.1.3, LDOS 5.1.4,
. TRSDOS 6.01.01, TRSDOS 6.01.02 and TRSDOS 6.02.00
.May not work with certain software packages:
. Experiment with backup disks to determine which
. combination of options works best with your
. applications.
.Leave out the options you do not want or cannot use
.FOR LDOS 5, include the next line:
.SET *KI TO KI/DVR (DELAY=10,RATE=1,JKL)

.OPTION 1 - Build Routine/KSM to define Keystroke Multiply
.Starts at letter A, ends at letter Z
.Change to suit your needs, but be sure all 26 keys
. are defined, or type NOT USED in the appropriate place
BUILD ROUTINE/KSM
DIR :0 (A);
DIR :1 (A);
FREE :0;
FREE :1;
DEVICE;
FORMAT :1 (Q=N);
BACKUP :0 :1;
BACKUP :0 :1 (X);
BACKUP :1 :0 (X);
NOT USED
BASIC;
LIST;
NOT USED
NEW;
DIR :0 (P);
DIR :1 (P);
FREE :0 (P);
FREE :1 (P);
SAVE"
```

Listing continued



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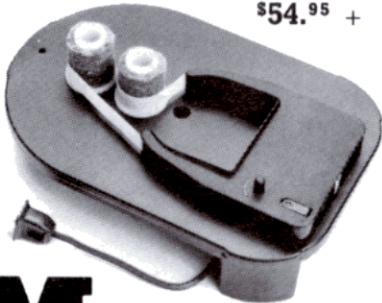


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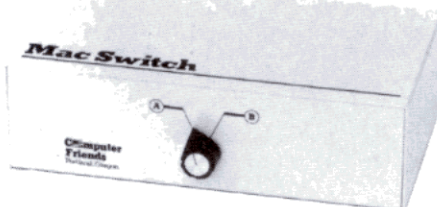
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Listing continued

```

RUN
RUN;
LOAD
SPOOL *PR (NO);
NOT USED
SPOOL (CLEAR);
BOOT;
.ROUTINE/KSM has terminated automatically
.Now setting defineable keys using above file
SET *KB KSM/FLT USING ROUTINE/KSM
.FOR LDOS 5: Delete next line before running:
FILTER *KI *KB

.
.OPTION 2 - Set Communications line device for RS-232C use
SET *CL TO COM/DVR
.FOR LDOS 5: replace ABOVE line with:
.SET *CL TO RS232T/DVR (BAUD=300,WORD=7)

.
.Option 3 - Set keyboard keyclick option TRSDOS 6 ONLY
.Works ONLY with TRSDOS 6.01.02 or earlier on Model 4
.The click may be too shrill with TRSDOS 6.02
.FOR LDOS 5: Delete the next two lines:
SET *CK CLICK/FLT
FILTER *KI *CK

.
.Option 4 - Set printer filter and printout form
SET *FF TO FORMS/FLT
FILTER *PR *FF
FORMS (MARGIN=10,CHARS=60,INDENT=17)
.FOR LDOS 5, replace ABOVE three lines with:
.FILTER *PR PR/FLT (CHARS=60,MARGIN=10,INDENT=17)

.
.Option 5 - Set keyboard repeat delay and rate
.FOR LDOS 5: This was done at the beginning for LDOS
.FOR LDOS 5: Delete next line
SETKI (WAIT=10,RATE=1)

.
.Option 6 - Install all allowable TRSDOS 6 overlays
.Delete those not desired before running SETUP/JCL
.LDOS 5 users should also install overlay 8
.NOTE: loading all overlays has caused program errors
. while running some BASIC and machine language
. programs including SuperSCRIPSIT ; load only needed
. overlays or test as required
SYSTEM (SYSRES=1)
SYSTEM (SYSRES=2)
SYSTEM (SYSRES=3)
SYSTEM (SYSRES=4)
SYSTEM (SYSRES=5)
.FOR LDOS 5 ONLY: Add the next line
.SYSTEM (SYSRES=8)
SYSTEM (SYSRES=9)
SYSTEM (SYSRES=10)
SYSTEM (SYSRES=11)
SYSTEM (SYSRES=12)

.
.OPTION 7 - FOR LDOS 5 users only
.Establish MINIDOS/FLT: add the line below
.FILTER *KI USING MINIDOS/FLT

.
.Installation concluded

.
.When this JCL file ends, type:
.SYSGEN (YES) FOR TRSDOS 6, OR
.SYSTEM (SYSGEN=ON) FOR LDOS 5
. and <ENTER> to permanently install changes.
.END OF SETUP/JCL BY KEITH E. RISLER
    
```

End



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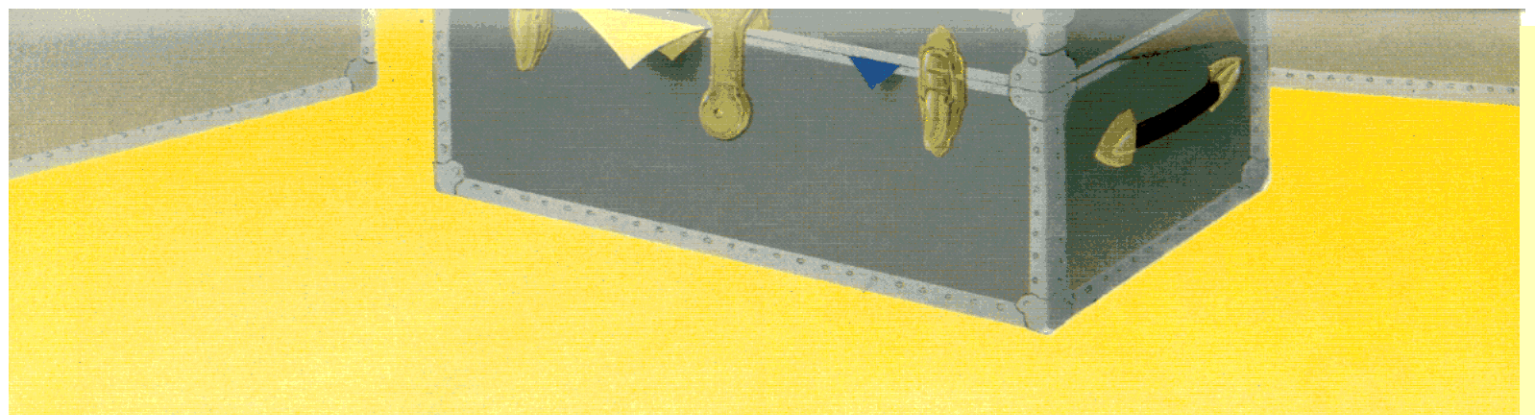
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Storage to Spare

**Increase SuperScripsit's text storage space
beyond your wildest dreams.**

by Steve Woicik

SuperScripsit users know things can get pretty cramped on their disks. It's not unusual to get a "Disk full" error message when you try to compress or convert a file. When you add in the dictionary program, you have barely enough room left over for documents.

I'll describe a way to get greatly increased SuperScripsit disk storage capacity on a one- or two-drive Model 4/4P using Memdisk. And, because the word processor and three system files reside in RAM, you'll find that the program runs faster.

Here's how it works. You develop a minimum TRSDOS, with three system files in memory and four files on a drive-zero data disk. A special booting disk puts your computer under JCL (job control language) control, loads a minimum SuperScripsit into Memdisk, and loads TRSDOS system files 1, 2, and 3 into memory. With SuperScripsit in memory, you replace the booting disk with a drive-zero data disk containing system files 4, 10, 11, and 12; the rest of the disk is free for data storage. Drive 1 is also free for data. For extra storage, you can use data disks formatted for 42 tracks.

Using 42-track disks, this gives you 174K for documents on drive zero and 181.5K on drive 1, a total of 355.5K. With Scripsit Spelling Dictionary on drive zero, you still have 181.5K of disk space on drive 1. Disk storage on a one-drive Model 4 increases to 171K.

The procedures below are for dual-drive computers; most apply to single-drive systems as well, but see "Instructions for One-Drive Computers" for specific changes.

These Disks Are Made for Booting

Your first order of business is to create a SuperScripsit booting disk. Boot a back-

up copy of a standard TRSDOS disk with SuperScripsit in drive zero and put a disk with Memdisk/DCT in drive 1. Type in `PURGE :0` and press the enter key.

To purge a file, type in Y and press the enter key; to retain a file, press the enter key only. Retain the files listed in the Table and purge any other visible files.

Next, copy Memdisk to drive zero using the command `COPY MEMDISK/DCT:1 :0`.

Load system files 1, 2, and 3 into RAM by typing in `SYSTEM (SYSRES = 1)`, `SYSTEM (SYSRES = 2)` and `SYSTEM (SYSRES = 3)`. `SYSGEN` these files by typing in `SYSGEN (YES)`.

Now build the two JCL files, `Scripsit/JCL` and `Exit/JCL`, in Program Listing 1. At TRSDOS Ready, type in `BUILD SCRIPSIT/JCL:0`. Carefully type in `SCRIPSIT/JCL`. To save the file to disk, press the control, shift, and @ keys simultaneously. Build `Exit/JCL`, also in Listing 1, the same way.

To execute `Scripsit/JCL` automatically each time you boot the disk, type in `AUTO DO = SCRIPSIT/JCL :0`. Your Scripsit booting disk is now complete.

The Bare Essentials

To create a drive-zero data disk, put a standard system disk in drive zero and format a disk in drive 1. I use the command `FORMAT:1(CYL = 42,Q = N,ABS)` to format 42 cylinders, giving me an extra 9K per disk. This technique might not always work, but I've used it successfully.

After formatting, copy system files 4, 10, 11, and 12 to drive 1. These files are protected, so you must use the Back-up utility to move them; type in `BACKUP :0 :1(SYS,Q = Y)`. Use the enter key to move from file to file. Type in Y and press the enter key to copy a file. After you've copied the four files, press the break key to quit.

This disk containing only four system

files is your drive-zero data disk. It has plenty of room for documents, but you don't have access to TRSDOS commands like Copy, Backup, Reset, Boot, and Remove.

To use Scripsit Dictionary, follow the procedure for creating a minimum system disk, making sure the computer verifies all 42 cylinders. Otherwise, you may not have room for the dictionary. Load system files 10 and 12 into RAM using the `SYSRES` command.

Leave the minimum TRSDOS disk in drive 1 and, from TRSDOS Ready, type in `BACKUP :0 :1 (Q = N,X)` and press the enter key. Remove the standard TRSDOS disk from drive zero and, when prompted for the source disk, replace it with a backup copy of the dictionary. Then answer the prompts to complete the back-up.

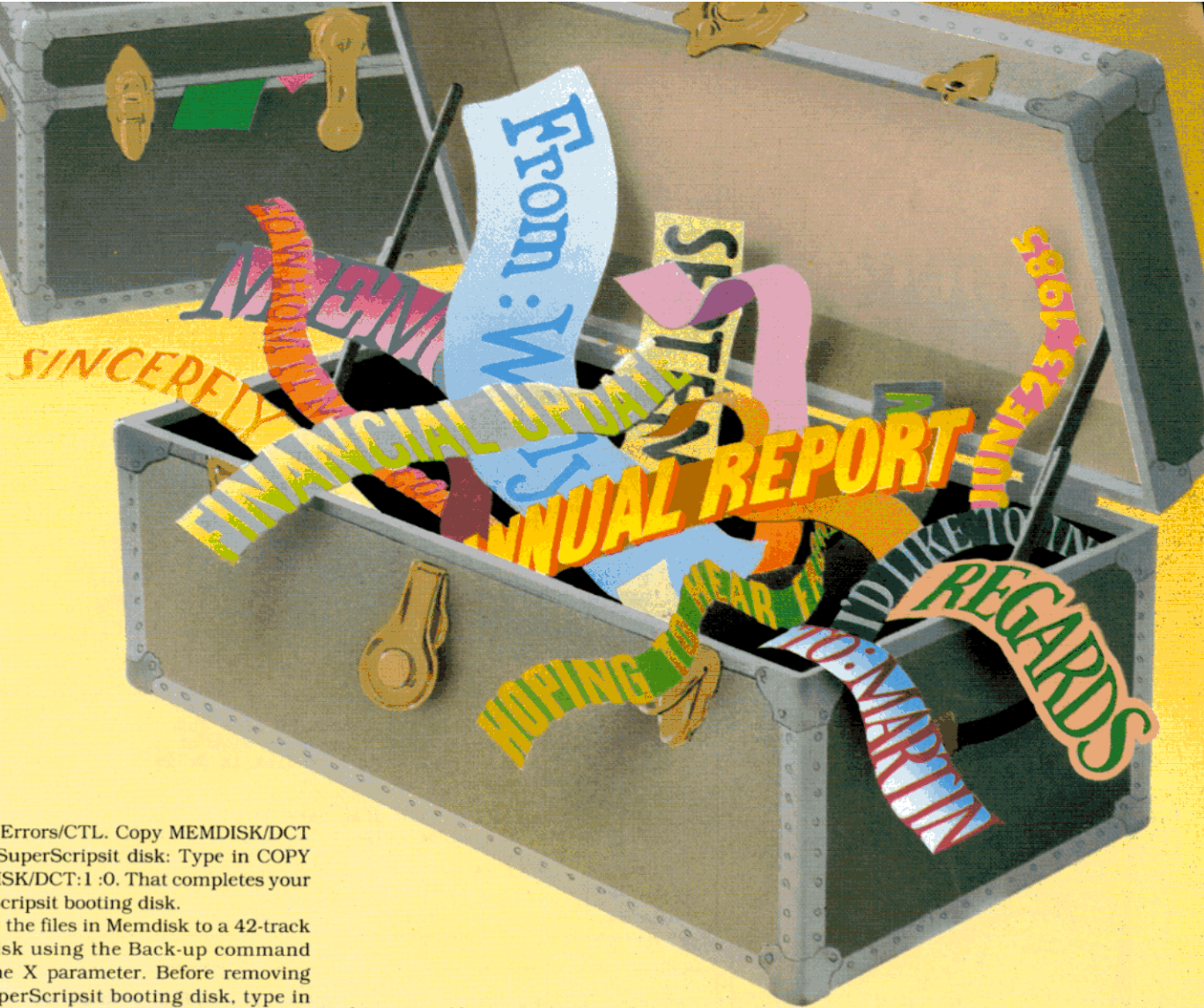
Instructions for One-Drive Computers

On a one-drive computer, boot up a back-up copy of TRSDOS 6.X.X with SuperScripsit, and load system files 1, 2, and 3 into memory and `SYSGEN` them as described above. Build Listing 2's versions of `Scripsit/JCL` and `Exit/JCL`.

Next, boot up a standard TRSDOS 6.X.X disk and install Memdisk by typing in `SYSTEM (DRIVE = 1, DRIVER = "MEMDISK")` and pressing the enter key. Answer the prompts with D, D, and Y. Copy Memdisk/DCT to Memdisk; type in `COPY MEMDISK/DCT:0 :1`.

Now put the SuperScripsit booting disk back in the drive and copy system files 4, 10, 11, and 12, and `Errors/CTL` to Memdisk. To do so, type in `BACKUP :0 :1 (SYS,Q = Y)`; use the enter key to move from file to file and press Y to copy a file.

Following the instructions above, purge the disk, saving all the files in the Table



except Errors/CTL. Copy MEMDISK/DCT to the SuperScript disk: Type in COPY MEMDISK/DCT:1:0. That completes your SuperScript booting disk.

Copy the files in Memdisk to a 42-track data disk using the Back-up command with the X parameter. Before removing the SuperScript booting disk, type in BACKUP:1:0(SYS,Q=N,X) and press the enter key. At the prompt, replace the SuperScript disk with your data disk and the back-up will begin.

Off and Running

Now for the easy part. To run SuperScript, put the booting disk in drive zero and a formatted data disk in drive 1. Boot the system. When the JCL program prompts, replace the booting disk with your drive-zero data disk, and you're in business.

Each time you boot up, Scriptit/JCL copies Exit/JCL to drive 1. Exit/JCL keeps SuperScript under JCL control until it copies the /CTL files to disk; this is necessary to save system changes made to SuperScript. Your original drive-1 disk must remain in place until you exit SuperScript; otherwise, Exit/JCL won't copy the /CTL files.

To exchange your drive-1 disk without losing JCL control, exit SuperScript and, at the prompt, install the booting disk and press the break key. With your new disk in drive 1, restart the JCL file by typing in DO = EXIT/JCL:1 and pressing the enter key. It's important to use the equal sign option, which keeps Exit/JCL from compiling to a System/JCL file on

drive zero. Also, you must use the drive 1 extension, or the JCL will abort.

You can exchange your drive-zero data disk at any time as long as you don't need to block move or block copy text; SuperScript stores block move/copy data on drive zero in a file called Move/CTL.

If, by the way, drive zero doesn't have room for Move/CTL, SuperScript locks up when you try to execute a Block Move or Block Copy command. As I've found no solution for this lockup except resetting the computer, be sure to copy your document using the Compress Document utility before trying a block move or block copy.

I've tried most SuperScript commands under this stripped-down operating system and found they work perfectly. However, at least during a shakedown period, I recommend making copies of valuable documents.

For SuperScript 1.1.0 Owners

The new version of SuperScript, 1.1.0, and the earlier version, 1.0.1, run under full or minimum TRSDOS 6.1.2 or 6.2. However, the new version (at least the one I received) comes with a minimum TRSDOS 6.2 that has some problems.

To use the increased storage method

with the new version of SuperScript, boot up a back-up copy of TRSDOS 6.2 and hold down the clear key. Purge all visible files except Memdisk/DCT and CONV/CMD. Purge all invisible files except Backup/CMD, Format/CMD, and Patch/CMD. Copy Scriptit/CMD and all SuperScript /CTL files except the printer drivers to the new TRSDOS disk. Copy the printer driver you use to the disk. Then load system files 1, 2, and 3 into RAM as indicated above under "These Disks are Made for Booting" and follow the remaining instructions in the article. ■

You can reach Steve Woicik at 1178 Bethany Ave., Turlock, CA 95380.

**LOAD
80**

System Requirements

Model 4
128K RAM
SuperScript
Scriptit Spelling Dictionary optional

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Assignment (LET)	178	28	20	7.3
Array Reference (1 dim)	35	36	36	3.5
Array Reference (2 dim)	30	30	30	3.0
AND OR	35	18	16	
Compare (= > < etc.)	23	20	16	6.6
Add Concatenate (+)	57	18	14	3.6
Subtract (-)	15	15	13	
Multiply (*)	108	117	102	9.3
Divide (/)	77	70	84	
Constant Reference	7.1	19		
FOR-NEXT	111	68	48	
POKE	10	45	36	
SET RESET	47	46	30	8.1
IF THEN ELSE	33	43	35	
ON expression GOTO	50	68	51	
ON expression GOSUB	12	101	103	1.2
PRINT simple variable	61	50	37	
OUT				
Flow of Control			216	
GOTO			74	
GOSUB/RETURN				
Functions		int	int	int
VARPTR	5.2	19	1.7	
POINT	38	23	1.7	
INP	149	23	2.0	
PEEK				
String Functions				5.3
ASC				258
LEN				4.8
LEFT\$				4.7
RIGHT\$				6.4
MID\$				25
CHR\$				36
CVI				7.1
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CVS				4.4
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SCR18/CTL SCR19/CTL SCR32/CTL SCR33/CTL SCR35/CTL
SCR38/CTL SCR50/CTL SCRIPSIT/CMD SCRIPSIT/CTL SYSTEM/CTL
*PRINTER

*Save the printer driver you are using.

Table. Files to retain when creating a SuperScript booting disk.

Program Listing 1. Scripsit/JCL and Exit/JCL for dual-drive Model 4's. If your printer driver doesn't have a /CTL extension, copy it to drive 2 by inserting a Copy command line before the line COPY EXIT/JCL:0 : 1.

```
.SCRIPSIT/JCL: Two-drive version
.
//FLASH Make sure a formatted data disk is in drive 1.
Press enter.
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
D
D
Y
BACKUP /CTL:0 :2
COPY SCRIPSIT/CMD:0 :2
COPY EXIT/JCL:0 :1
DO = EXIT/JCL:1
//EXIT
```

```
. EXIT/JCL: Two-drive version
. Remove the SuperScript booting disk and
. Install the drive zero dictionary disk or
//FLASH Put the drive zero data disk in drive
zero. Press enter.
SCRIPSIT
. Remove the drive zero disk data disk.
//FLASH Put the SuperScript booting disk in drive zero.
Press enter.
BACKUP /CTL:1 :0
//EXIT
```

End

Program Listing 2. Scripsit/JCL and Exit/JCL for single-drive Model 4's. If your printer driver doesn't have a /CTL extension, copy it to drive 1 by inserting a Copy command line before the line COPY EXIT/JCL:0 :1.

```
.SCRIPSIT/JCL: One-drive version
SYSTEM (DRIVE=1,DRIVER="MEMDISK")
D
D
Y
BACKUP /CTL:0 :1
COPY SCRIPSIT/CMD:0 :1
COPY EXIT/JCL:0 :1
DO = EXIT/JCL:1
//EXIT
```

```
. EXIT/JCL: One-drive version
. Remove the SuperScript booting disk and
//FLASH Put the drive zero data disk in drive
zero. Press enter.
SCRIPSIT
. Remove the drive zero disk data disk.
//FLASH Put the SuperScript booting disk in drive zero.
Press enter.
BACKUP /CTL:1 :0
//EXIT
```

End



Full Recovery

by Ken W. Pavlicek

SuperScript has a lot of features, but it's missing a vital one: a file recovery capability. If a disk error or improperly closed file causes damage, you're stuck. The next time disaster strikes, try my Model 4 file repair program (see Program Listing 3). It rescues most SuperScript documents from the void; you have to do some editing, but it beats retyping a file from scratch.

Before resorting to my program, however, try a couple of quick fixes. Type in RESET File Name at TRSDOS Ready or run the following routine:

```
10 OPEN "T",1,"filename":CLOSE
```

If neither method works, load and run the repair program, but first make sure your disk has room for the damaged file and its replacement.

The program prompts you for the input (damaged) file's name and the output (replacement) file's name. The output file's name must be different or have a different extension.

Now the program displays the file 128 characters at a time.

The bottom of the screen displays your options:

```
C)har prog—Invokes a subprogram that strips individual characters
S)ave line—Saves the line on the screen
D)lete line—Deletes the line on the screen
F)ile save—Saves the remainder of the document
Q)uit—Stops recovery, saving no more text
```

Before you start repairing the text, strip off SuperScript's header information by pressing D until you see the start of the document on screen. Then you can invoke any of the options listed above.

If the line on screen is correct, press S to save it. If only part of the line is correct, press C to invoke the character program. This displays the line one character at a time along with the options:

```
S)ave character—Saves the character on the screen
D)lete character—Deletes the character on the screen
L)ine save—Saves the rest of the line
Q)uit—Stops, saving no more of the line
```

After you exit the repair program, load SuperScript and select the ASCII conversion program. Again make sure your disk has enough room for the new file.

When the conversion menu appears, select "A" and type in the file names at the prompts. Don't duplicate file names, and use the repair program's output file for the name of the ASCII file. SuperScript will convert the correct file to SuperScript format.

You have to edit the converted file, since most of its control codes are gone. First, find the character that replaces the paragraph symbol. In most cases, it's a double letter. Use the global command to replace every occurrence of this double letter with a double paragraph symbol. Use S's character search at the global menu, and press control-G to produce the paragraph symbol. Then, since the program removes all clear symbol codes, replace them with the help of the global command.

The next step requires scanning the whole document to replace the double-space triangle and the wordwrap symbol, which you can't do with the global command.

Use the right-arrow key to move the cursor through the document. At the end of a sentence, insert a double space. When two words run together, insert a single space. As you do this, you should replace any other missing code, such as tabs or centering. ■

Program Listing 3. SuperScript file repair program.

```
10 'SUPERSCRIPIT FILE REPAIR BY KEN PAVLICEK
20 CLEAR
30 CLS
40 INPUT "WHAT IS THE NAME OF THE INPUT FILE ";I1$
50 INPUT "WHAT IS THE NAME OF THE OUTPUT FILE ";I2$
60 OPEN "R",1,I1$,128
70 OPEN "O",2,I2$
80 FIELD 1,128 AS AS
```

Listing 3 continued

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Tidbit #21

One of the clever tricks I tried as a beginning programmer was the statement GOSUB X to shunt program execution to a subroutine. I was sure this was a never-before-discovered solution to the problem of selecting the appropriate subroutine for varying conditions. After all, the GOSUB statement required a line number and the variable X was a number I could control.

Of course the program crashed. GOSUB and GOTO statements must precede a literal line number. I went back to the manual, and forgot about my clever trick.

Recently, a friend asked me how to use GOSUB X without crashing his program. My reaction was to tell him it was impossible. He protested. He documented all the good reasons why GOSUB X was the only logical way to write his program. He was right. As I reflected on my friend's program, I hit upon a way to use GOSUB X. The Program Listing shows how. It puts the value of X into a five-character string, with leading zeros if necessary. It then POKEs the string into line 1 after the GOTO statement. GOSUB 1 branches to the line represented by X's value. After all these years, GOSUB X really works.

Harry Bee
Cornish, ME

```
1 GOTO 01000
1000 L=PEEK(&H40A4)+PEEK
(&H40A5)*256+6
10000 X$=STR$(X):Y$=RIGHT$(
X$,LEN(X$)-1)
10010 Z$="":Y=LEN(Y$)
10020 IF Y<5 THEN Z$=STRING$(
5-Y,48)
10030 X$=Z$+Y$
10040 FOR Z = 1 TO 5
10050 POKE L+Z-1,ASC
(MID$(X$,Z,1))
10060 NEXT Z:GOSUB 1
```

Listing 3 continued

```
90 ON ERROR GOTO*640
100 FOR C1=1 TO LOF(1)
110 CLS
120 GET 1,C1
130 GOSUB 660
140 PRINT A2$
150 PRINT@1840,"C)har. Prog, S)ave line, D)delete line, F)ile save, Q)uit"
160 IS=INKEY$
170 IF IS="C" GOTO 260
180 IF IS="S" THEN PRINT# 2, A2$;:GOTO 230
190 IF IS="D" THEN 230
200 IF IS="F" THEN CLS:GOTO 470
210 IF IS="Q" THEN 240
220 GOTO 160
230 NEXT C1
240 CLOSE
250 END
260 L=LEN(A$)
270 CLS:A2$="":A1$=""
280 FOR X=1 TO L
290 A1$=MID$(A$,X,1)
300 IF ASC(A1$)=248 OR ASC(A1$)=247 THEN A1$=" "
310 IF ASC(A1$)<32 OR ASC(A1$)>122 THEN 430
320 PRINT@0+X,A1$;
330 PRINT@1840,"S)ave char, D)delete char, L)line save, Q)uit";
340 IS=INKEY$
350 IF IS="S" THEN 400
360 IF IS="D" THEN 430
370 IF IS="L" THEN 550
380 IF IS="Q" THEN 460
390 GOTO 340
400 PRINT@1040+X1,A1$;
410 A2$=A2$+A1$
420 X1=X1+1
430 NEXT X
440 PRINT@1840,"END OF LINE. PRESS <ENTER> TO CONTINUE";
450 IS=INKEY$:IF IS<>CHR$(13) THEN 450
460 GOTO 150
470 ON ERROR GOTO 650
480 FOR C2=C1 TO LOF(1)
490 GET 1,C2
500 GOSUB 660
510 PRINT A2$;
520 PRINT#2, A2$;
530 NEXT C2
540 GOTO 240
550 FOR N=X TO L
560 A1$=MID$(A$,N,1)
570 IF ASC(A1$)=248 OR ASC(A1$)=247 THEN A1$=" "
580 IF ASC(A1$)<32 OR ASC(A1$)>122 THEN 610
590 A2$=A2$+A1$
600 X1=X1+1
610 NEXT N
620 PRINT@1040,A2$
630 GOTO 150
640 RESUME 230
650 RESUME 530
660 L=LEN(A$):A1$="":A2$=""
670 FOR X=1 TO L
680 A1$=MID$(A$,X,1)
690 IF ASC(A1$)=248 OR ASC(A1$)=247 THEN A1$=" "
700 IF ASC(A1$)<32 OR ASC(A1$)>122 THEN 720
710 A2$=A2$+A1$
720 NEXT X
730 RETURN
```

End

Tidbit #22

Here's a program you can use from Basic to find out how many free granules are available on a drive-zero disk. You can run the routine directly or incorporate it into another program.

Mark Taylor
Ogden, UT

```
10 DEFUSR=-304 'START
ADDRESS OF ROUTINE
20 FOR A=-304 TO -294:READ B:
POKE A,B:NEXT A 'READ DATA
30 X=USR(0) 'READ DISK AND PUT
FREE SPACE AT LOCATION -254
40 PRINT "**** ";PEEK(-254);"
FREE GRANULES ****"
50 DATA 6,0,14,255,33,0,255,
205,144,66,201
```

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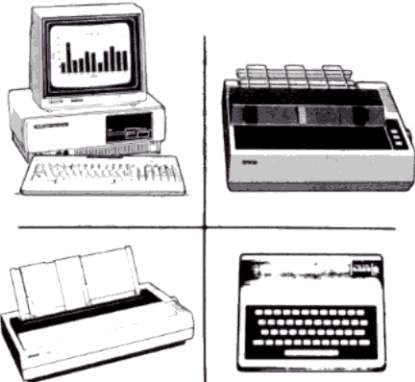
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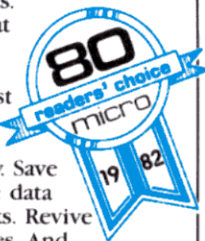
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ROOM AVAILABLE

by Stewart F. Hunter

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My Compress and Decompress programs use Huffman's method of conserving disk space to convert Model I/III Scripsit text files from ASCII to Huffman format and back again (see Program Listings 1 and 2; see Fig. 1 for Model I conversions).

The Huffman Method

Your computer uses an 8-bit ASCII code for each keyboard character it stores. Huffman's algorithm takes a most-common-denominator approach to text storage. Simplistically, the Huffman algorithm determines which character occurs most frequently

in a document and assigns a 1-bit code to that character (called the Huffman code). It designates the next-most-frequently occurring character a 2-bit code, and so on through the fourth most-used character.

Huffman code represents the fifth through 19th characters with 8 bits, and represents any remaining characters using 16 bits. See Fig. 2 for a screen dump of a conventional Scripsit file sector and its Huffman counterpart.

The only savings in storage occurs for the first four characters, but since those

are the ones that appear most frequently, you end up with a net savings in disk space.

The Table provides an example of Huffman code. The characters in the first column represent those most frequently occurring in English text. The second column indicates each character's Huffman code. Of course, the characters Compress and Decompress use in reducing the size of a file will differ from those shown in the Table because each file displays a different character frequency.

Compression Limits

Compress reduces the size of language text files only. These compressed files appear as gibberish if you print them out.

You usually can't reduce the size of files containing programming code or numerical data—doing so often results in "compressed" files larger than the original.

The larger the original file, the greater the reduction. Files only a few disk sectors long result in little, if any, space saving.

LOAD
80

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Models I and III

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Listing 1, lines 250, 300, and Listing 2, lines 250, 300, and 1200 should be CALL DISPLAY.

Listing 1, lines 3270, 3300, and Listing 2, lines 1270, 2090, and 2120 should be DEFB 0.

Listing 1, line 3250, and Listing 2, lines 1220, 1240, 1260 and 2070 should contain DEFB 0DH.

Listing 1, line 3280, and Listing 2, line 2100 should contain DEFW 0D0DH.

Insert the following after line 3300 in Listing 1 and after line 2160 in Listing 2:

```

;DISPLAY MESSAGE POINTED TO BY HL REGISTER
DSPLAY LD A,(HL)
        OR A
        RET Z
        CALL 33H
        INC HL
        JR DSPLAY

```

Figure 1. Model I conversions for Compress and Decompress.

Character	Binary code
space	1
e	01
t	001
a	0001
o	00000001
i	00000010
n	00000011
s	00000100
r	00000101
h	00000110
l	00000111
d	00001000
c	00001001
u	00001010
m	00001011
f	00001100
p	00001101
g	00001110
w	00001111
other characters	00000000 plus ASCII value

Table. Example of Huffman code.

```

(a) 100100: 3E4C 533D 3120 4A3D 4E8D 8D44 6570 6172 >LS=1 J=N..Depar
100110: 746D 656E 7473 2F43 6F6C 756D 6E73 8E20 tments/Columns.
100120: 2020 2020 4E65 7720 596F 726B 2773 2072 New York's r
100130: 6567 756C 6172 2063 6F6C 756D 6E73 2075 egular columns u
100140: 6E64 6572 7765 6E74 2073 6576 6572 616C nderwent several
100150: 2063 6861 6E67 6573 2064 7572 696E 6720 changes during
100160: 6974 7320 6669 7273 7420 6665 7720 7965 its first few ye
100170: 6172 732E 2020 536D 616C 6C20 636F 6C75 ars. Small colu
100180: 6D6E 7320 696E 2074 6865 2066 726F 6E74 mns in the front
100190: 206F 6620 7468 6520 626F 6F6B 2028 224D of the book ("M
1001A0: 6F63 6B20 4B6E 6973 6865 7320 416E 6420 ock Knishes And
1001B0: 4572 7361 747A 2050 6963 6B6C 6573 2220 Ersatz Pickles"
1001C0: 616E 6420 2254 686F 7365 2057 686F 204C and "Those Who L
1001D0: 6976 6520 4279 2074 6865 2049 6D61 6765 ive By the Image
1001E0: 2E2E 2E22 2028 4170 7269 6C20 382C 2031 ..." (April 8, 1
1001F0: 3936 3829 2920 6861 6420 616E 2049 6D61 968) had an Ima

(b) 000100: 2065 7461 736F 6E69 6C68 7264 636D 752E etasonilhrdcmu.
000110: 6770 6600 3E00 4C00 5300 3D00 3180 2500 gpf.>.L.S.=.1.%.
000120: 1E00 2700 4680 4680 2221 C20E 4290 3202 ..'.F.F.'B.B.2.
000130: 005E 0086 040A 1614 0602 011D F004 E401 .....p.d.
000140: DE00 B204 0E00 D600 4E03 0743 42C1 441E ^.....V.N..CBAD.
000150: 1204 0A16 1406 030B 0308 41C0 1DD0 3301 .....A@.P3.
000160: 401D 9071 0584 8308 186A 0308 0B07 0403 e..q.....j.....
000170: 0D82 1018 7820 3809 87A0 0EF0 0794 41C0 ....x 8....p..A@
000180: 4330 0530 A105 0584 8102 8585 0180 C100 C0.0.....A.
000190: E419 8783 8101 9810 7C83 3006 2020 2006 d.....|.0.
0001A0: B801 4001 1002 6810 4803 5C01 2C0C 1004 ..e...h.H.\.....
0001B0: 1901 8020 8184 4011 41C0 4480 3D40 1401 ...e..e.A@D.=e..
0001C0: 0240 1AC1 5010 0228 8184 4008 8015 0180 ..e.AP..(..e....
0001D0: 8058 02B8 3014 0130 1001 D900 2100 3CC8 .X..0..0..Y.I.<H
0001E0: 3300 490A 10D4 3030 3000 8A00 5000 821C 3.I..T000...P..
0001F0: 0E08 0B00 3800 2C00 1800 1C00 1B00 1C00 .....8.....

```

Figure 2.(a) Screen dump of a Scripsit file sector. (b) Screen dump of the same sector in Huffman format.

Program Listing 1. Compress program.

```

00100 ;*****
00110 ;# "COMPR" TEXT COMPRESSOR #
00120 ;# VERSION 2.1 #
00130 ;# Copyright 1984 by Stewart F. Hunter #
00140 ;*****
00150 ;
00160 ORG 7000H
00170 ENTRY CALL 01C9H ;CLEAR THE SCREEN
00180 LD HL,BUFFER ;INITIALIZE
00190 LD (BYTCTR),HL ;POINTER TO NEXT BYTE IN BUFFER
00200 LD HL,2047
00210 LD (BTCTR),HL ;COUNT OF BITS IN BUFFER
00220 LD A,8
00230 LD (BYTCTR),A ;COUNT OF BITS PER BYTE
00240 LD HL,IMSG ;ASK FOR INPUT FILE NAME
00250 CALL 21BH
00260 LD HL,IDCB
00270 LD B,24

```

Listing 1 continued

Compressing

After assembling Compress to disk, run the program. A prompt asks for the name of the file you want to compress. Insert the disk with the appropriate ASCII file, type in the file name, and hit the enter key.

A second prompt asks for the name of the file to which you want the compressed text saved. Make sure the disk contains enough free space to hold the new file. A good rule of thumb is to allow as much free space as the original file occupies.

After you enter the second file name, Compress reads the original file and displays it line by line on-screen. The display occasionally pauses while Compress writes to the output file. The program returns to the DOS Ready prompt when finished.

Your disk then contains two files: the original and the compressed file. Kill the original file and you end up with an overall increase in disk space.

Decompressing

To recover text from the compressed file, assemble and run Decompress. The program prompts you for the name of the file to decompress. Insert the disk containing the compressed file and type in the file name.

Then enter a file name for the decompressed text at the prompt. Decompress reads the compressed file, converts it to ASCII, and writes it to the output file. The output text appears on the screen. Decompress exits to DOS Ready when finished.

How It Works

In Listing 1, lines 170-230 initialize several variables Compress uses. Lines 240-450 get the names of the input and output files, open the input file, and create the output file.

Lines 460-750 read each character from the input file and store a count of each

Make sure the disk contains enough space for the new file. A good rule of thumb is to allow as much free space as the original file occupies.

character's occurrence in a 256-byte table in memory. A second 256-byte table initializes with the value of all ASCII characters. Compress uses these two tables to determine the frequency of each character in the input file.

Then Compress sorts the table of character occurrences in descending order (lines 760-1130). Because the two tables are only 256 bytes long I used a simple bubble sort. A more sophisticated sort routine won't increase execution speed much for a table this short.

After the sort, Compress installs the four most frequently appearing characters in the first 4 bytes of the second table and the next 15 most frequent characters in the table's next 15 bytes.

Compress uses these 19 characters in lines 1140-1260 to alter several locations in the program. Compress stores the locations in the table in lines 3450-3630.

Lines 1270-1370 write the first 19 bytes of the table of characters to the output file. Decompress uses these characters to decode the file.

Lines 1380-1520 read a character from the input file starting at the first character in the file. Lines 1530-1740 determine if the character read is one of the four most frequent. If so, Compress converts the character to Huffman code, writes it to the output file buffer, and reads the next character from the input file.

If the character isn't one of the four most frequent characters, lines 1750-1960 check if it's one of the 15 next most frequent. If so, the program encodes the character and writes it to the output file buffer. If it isn't one of these 15 characters, lines 2060-2100 encode the character using 16 bits.

Decompress contains several of the same subroutines as Compress. In Listing 2, lines 170-230 initialize variables that the program uses. Lines 240-460 get the input and output file names and open the files.

Lines 470-570 read the first 19 bytes from the input file. These bytes represent the character frequency table that Compress wrote. Lines 580-740 use the character frequency table to alter the program at the addresses held in the table in lines 1820-2040.

Lines 750-870 read an encoded character

Listing 1 continued

```

701F CD4000 00280 CALL 40H ;INPUT LINE INTO (HL)
7022 211975 00290 LD HL,OMSG ;ASK FOR OUTPUT FILE NAME
7025 CD1B02 00300 CALL 21BH
7028 21AF72 00310 LD HL,ODCB
702B 0618 00320 LD B,24
702D CD4000 00330 CALL 40H
7030 217875 00340 LD HL,IBUFFR
7033 116F72 00350 LD DE,IDCB
7036 0601 00360 LD B,1
7038 CD2444 00370 CALL 4424H ;OPEN INPUT FILE
703B C2CA71 00380 JP NZ,DSKERR ;JUMP IF DISK ERROR
703E 3E01 00390 ENTRY2 LD A,1
7040 327872 00400 LD (IDCB+9),A ;MAKE LRL = 1
7043 218876 00410 LD HL,BUFFER
7046 11AF72 00420 LD DE,ODCB
7049 0600 00430 LD B,0
704B CD2044 00440 CALL 4420H ;CREATE OUTPUT FILE
704E C2CA71 00450 JP NZ,DSKERR ;JUMP IF DISK ERROR
7051 21F472 00460 ENTRY3 LD HL,CFTBL
7054 11F572 00470 LD DE,CFTBL+1
7057 010001 00480 LD BC,256
705A AF 00490 XOR A
705B 77 00500 LD (HL),A
705C EDB0 00510 LDIR
705E 21F473 00520 LD HL,CFTBL2
7061 AF 00530 XOR A
7062 0600 00540 LD B,0
7064 77 00550 ENTRY4 LD (HL),A
7065 23 00560 INC HL
7066 3C 00570 INC A
7067 10FB 00580 DJNZ ENTRY4
7069 216E72 00590 RBLP LD HL,CHAR
706C 116F72 00600 LD DE,IDCB
706F CD3644 00610 CALL 4436H ;READ A CHAR. FROM INPUT FILE
7072 CA7D70 00620 JP Z,ENTRY5 ;EOF?
7075 FE1C 00630 CP 28 ;JUMP IF SO
7077 CA9170 00640 JP Z,SORT
707A C3CA71 00650 JP DSKERR
707D 21F472 00660 ENTRY5 LD HL,CFTBL ;HL=START OF CHAR. TABLE
7080 1600 00670 LD D,0
7082 3A6E72 00680 LD A,(CHAR)
7085 5F 00690 LD E,A ;DE=CHAR READ FROM INPUT
7088 19 00700 ADD HL,DE ;POINT TO CHAR COUNT
7087 3EFF 00710 LD A,255 ;CHAR COUNT=255?
7089 BE 00720 CP (HL)
708A CA9170 00730 JP Z,SORT
708D 34 00740 INC (HL)
708E C36970 00750 JP RBLP
7091 116F72 00760 SORT LD DE,IDCB
7094 010000 00770 LD BC,0
7097 CD4244 00780 CALL 4442H ;RESET INPUT FILE TO 1ST BYTE
709A C2CA71 00790 JP NZ,DSKERR
709D AF 00800 XOR A ;SORT CFTBL AND CFTBL2, DESCEND-
709E 32F474 00810 LD (SWFLG),A ;ING ORDER
70A1 110000 00820 LD DE,0
70A4 DD21F472 00830 SRTLTP LD IX,CFTBL
70A8 FD21F473 00840 LD IY,CFTBL2
70AC DD19 00850 ADD IX,DE
70AE FD19 00860 ADD IY,DE
70B0 DD7E00 00870 LD A,(IX)
70B3 DDBE01 00880 CP (IX+1)
70B6 D2DF70 00890 JP NC,NOSW
70B9 32F574 00900 LD (TEMP),A
70BC FD7E00 00910 LD A,(IY)
70BF 32F674 00920 LD (TEMP2),A
70C2 DD7E01 00930 LD A,(IX+1)
70C5 DD7700 00940 LD (IX),A
70C8 FD7E01 00950 LD A,(IY+1)
70CB FD7700 00960 LD (IY),A
70CE 3AF574 00970 LD A,(TEMP)
70D1 DD7701 00980 LD (IX+1),A
70D4 3AF674 00990 LD A,(TEMP2)
70D7 FD7701 01000 LD (IY+1),A
70DA 3E01 01010 LD A,1
70DC 32F474 01020 LD (SWFLG),A
70DF 13 01030 NOSW INC DE
70E0 3EFF 01040 LD A,255
70E2 BB 01050 CP E
70E3 C2A470 01060 JP NZ,SRTLTP
70E6 3AF474 01070 LD A,(SWFLG)
70E9 FE01 01080 CP 1
70EB C2F870 01090 JP NZ,DONE
70EE AF 01100 XOR A
70EF 32F474 01110 LD (SWFLG),A
70F2 110000 01120 LD DE,0
70F5 C3A470 01130 JP SRTLTP
70F8 0613 01140 ;AT THIS POINT 1ST 19 BYTES IN CFTBL2 ARE THE 19 MOST
70FA DD215275 01150 ;FREQUENTLY APPEARING CHARACTERS IN THE INPUT FILE
70FE 11F473 01160 DONE LD B,19 ;PUT 1ST 19 BYTES IN CFTBL2 INTO
7101 DD6E00 01170 LD IX,MODS ;ADDRESSES IN MODS TABLE
7104 DD6601 01180 LD DE,CFTBL2
7107 1A 01190 MODIFY LD L,(IX)
7108 77 01200 LD H,(IX+1)
7109 DD23 01210 LD A,(DE)
710B DD23 01220 LD (HL),A
710D 13 01230 INC IX
710E 10F1 01240 INC IX
7110 0613 01250 INC DE
7112 21F473 01260 DJNZ MODIFY
7115 C5 01270 ;WRITE 19 BYTES TO OUTPUT FILE
7116 7E 01280 LD B,19
7117 01290 LD HL,CFTBL2
7118 01300 MLOOP PUSH BC
7119 01310 LD A,(HL)

```

Listing 1 continued

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Listing 1 continued

```

7117 23      01320      INC HL
7118 E5      01330      PUSH HL
7119 CDA971   01340      CALL EIGHT
711C E1      01350      POP HL
711D C1      01360      POP BC
711E 10F5    01370      DJNZ MLOOP
              01380 ;READ A CHAR. FROM INPUT FILE
7120 216E72  01390 GCHAR LD HL,CHAR ;HL=ADRS OF CHAR. READ FROM INPUT
7123 116F72  01400      LD DE,DCB
7126 CD3644  01410      CALL 4436H ;CALL DOS READ ROUTINE
7129 2812    01420      JR Z,GCHAR2 ;JUMP IF NO ERROR
712B FE1C    01430      CP 28 ;END OF FILE?
712D C2CA71  01440      JP NZ,DSKERR ;JUMP IF NOT
7130 3E00     01450      LD A,0 ;ELSE WRITE END OF FILE CODE
7132 CDA971  01460      CALL EIGHT ;SEND 1ST EOF BYTE TO FILE
7135 3E04     01470      LD A,4
7137 CDA971  01480      CALL EIGHT ;SEND 2ND EOF BYTE TO FILE
713A C32F75  01490      JP CLOSE ;NOW CLOSE FILES
713D 3A6E72  01500 GCHAR2 LD A,(CHAR) ;DISPLAY CHARACTER READ
7140 CD3300   01510      CALL 33H
7143 3A6E72  01520      LD A,(CHAR)
7146 FE20     01530 CH1 CP ' ' ;CHAR=SPACE?
7148 C25171  01540      JP NZ,GCHAR3 ;JUMP IF NOT
714B CDDE71  01550      CALL CHECK1 ;SET HUFFMAN BIT IN BUFFER
714E C32071  01560      JP GCHAR
7151 FE65     01570 GCHAR3 CP 'e' ;=LOWER CASE 'E'?
7153 C25F71  01580      JP NZ,GCHAR4
7156 CDD271  01590      CALL CHECK0
7159 CDDE71  01600      CALL CHECK1 ;SET BUFFER BITS TO '01' IF SO
715C C32071  01610      JP GCHAR
715F FE74     01620 GCHAR4 CP 't' ;='T'?
7161 C27071  01630      JP NZ,GCHAR5
7164 CDD271  01640      CALL CHECK0
7167 CDD271  01650      CALL CHECK0
716A CDDE71  01660      CALL CHECK1 ;SET TO '001' FOR 't'
716D C32071  01670      JP GCHAR
7170 FE61     01680 GCHAR5 CP 'a' ;='a'?
7172 C28471  01690      JP NZ,GCHAR6
7175 CDD271  01700      CALL CHECK0
7178 CDD271  01710      CALL CHECK0
717B CDD271  01720      CALL CHECK0
717E CDDE71  01730      CALL CHECK1 ;SET TO '0001' FOR 'a'
7181 C32071  01740      JP GCHAR
              01750 ;CHECK IF CHARACTER= 0 THRU w
7184 215072  01760 GCHAR6 LD HL,TABLE ;TABLE OF CHAR. AND CODES
7187 1E02     01770      LD E,2 ;# OF BYTES/TABLE ENTRY
7189 060F     01780      LD B,15 ;# OF ENTRIES IN TABLE
718B 3A6E72  01790      LD A,(CHAR) ;= SEARCH CHAR.
              01800 ;SEARCH TABLE FOR CHAR.
718E 1600     01810      LD D,0
7190 BE       01820 SRCH CP (HL)
7191 CA9A71  01830      JP Z,SREND ;JUMP IF CHAR FOUND
7194 19       01840      ADD HL,DE
7195 10F9     01850      DJNZ SRCH
7197 21FFFF   01860      LD HL,-1 ;FLAG FOR NOT FOUND
              01870 ;IF CHAR. FOUND IT'S ADRS IS IN HL,ELSE HL=-1
719A 7C       01880 SREND LD A,H
719B A5       01890      AND L
719C FEFF     01900      CP 0FFH
719E ABC71   01910      JP Z,ESCGRP ;JUMP IF CHAR NOT 0 THRU w
              01920 ;CHAR IS IN 0 THRU w GRP SO WRITE 8 BIT CODE TO BUFFER
71A1 23       01930      INC HL ;HL POINTS TO 8 BIT CODE
71A2 7E       01940      LD A,(HL)
71A3 CDA971  01950      CALL EIGHT ;WRITE 8 BITS IN A TO BUFFER
71A6 C32071  01960      JP GCHAR
              01970 ;WRITE 8 BITS IN A REG TO BUFFER
71A9 0608     01980 EIGHT LD B,8 ;B HOLDS BIT COUNT
71AB CB27     01990 ELOOP SLA A ;SHIFT BIT INTO CARRY FLAG
71AD DAB671  02000      JP C,EIGHT1
71B0 CDD271  02010      CALL CHECK0 ;RESET BUFFER BIT
71B3 C3B971  02020      JP ECONT
71B6 CDDE71  02030 EIGHT1 CALL CHECK1 ;SET BUFFER BIT
71B9 10F0     02040 ECONT DJNZ ELOOP ;CONTINUE IF NOT DONE
71BB C9       02050      RET
71BC 3E00     02060 ESCGRP LD A,0 ;WRITE 0 CODE TO BUFFER
71BE CDA971  02070      CALL EIGHT
71C1 3A6E72  02080      LD A,(CHAR) ;WRITE 8 BIT ASCII CODE TO BUFFER
71C4 CDA971  02090      CALL EIGHT
71C7 C32071  02100      JP GCHAR
              02110 ;DISK INPUT/OUTPUT ERROR ROUTINE
71CA F6C0     02120 DSKERR OR 0C0H
71CC CD0944  02130      CALL 4409H
71CF C32D40  02140      JP 402DH
              02150 ;ROUTINE TO SET OR RESET THE NEXT BIT IN (BUFFER). THE
              02160 ;BUFFER BYTE CONTAINING THE BIT IS POINTED TO BY (BYTPTR)
              02170 ;THE BIT WITHIN THE BYTE IS POINTED TO BY THE 3 LOWER
              02180 ;BITS OF (BTCTR). THE BUFFER IS WRITTEN TO DISK WHEN
              02190 ;BIT 0 OF LAST BYTE IN BUFFER IS ALTERED.
              02200 ;ENTER AT CHECK0 TO RESET THE NEXT BIT.
              02210 ;ENTER AT CHECK1 TO SET THE NEXT BIT.
71D2 F5       02220 CHECK0 PUSH AF
71D3 C5       02230      PUSH BC
71D4 D5       02240      PUSH DE
71D5 E5       02250      PUSH HL
71D6 3E86     02260      LD A,86H
71D8 322072  02270      LD (INSTR+1),A ;ALTER OPCODE TO RES B,(HL)
71DB C3E771  02280      JP CHKA
71DE F5       02290 CHECK1 PUSH AF
71DF C5       02300      PUSH BC
71E0 D5       02310      PUSH DE
71E1 E5       02320      PUSH HL
71E2 3EC6     02330      LD A,0C6H
71E4 322072  02340      LD (INSTR+1),A ;ALTER OPCODE TO SET B,(HL)

```

Listing 1 continued

ter from the input file, determine if the character is one of the first four contained in the character frequency table, and write the ASCII equivalent to the output file when it is.

Lines 1100-1210 determine if the character is a 16-bit character and write the ASCII equivalent to the output file. The program continues looping through lines 750-1180 until it reaches the end of the input file. It then closes both files and exits to DOS.

Expanding on Compression

My Compress and Decompress programs are intended primarily to conserve disk space, but since compressed files are unintelligible, you can also use them to keep prying eyes away from sensitive data held in text files. ■

You can reach Stewart F. Hunter at 15510 Murray Hill, Detroit, MI 48227.

Related Articles

Miller, Franklyn D. "Compress It," March 1983, p. 336. Reduce the size of Basic programs by removing remark statements and improving program logic.

Wood, Charles. "Compress, Model II Style," Anniversary Issue 1983, p. 554. Compress Model II Basic programs.

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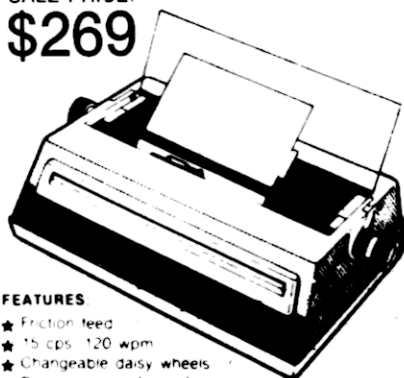
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Listing 1 continued

71E7 2AF172	02350	CHKA	LD HL,(BTCTR)	;GET COUNT OF BUFFER BITS
71EA 3E07	02360		LD A,7	
71EC A5	02370		AND L	;MASK OUT 3 LSB
71ED CB27	02380		SLA A	
71EF CB27	02390		SLA A	
71F1 CB27	02400		SLA A	
71F3 212072	02410		LD HL,INSTR+1	
71F6 B6	02420		OR (HL)	
71F7 77	02430		LD (HL),A	;INSERT 3 LSB INTO SET/RES OPCODE
71F8 2AF172	02440		LD HL,(BTCTR)	
71FB 2B	02450		DEC HL	;DECREMENT BIT COUNTER
71FC 22F172	02460		LD (BTCTR),HL	
71FF 7C	02470		LD A,H	
7200 A5	02480		AND L	
7201 FEFF	02490		CP 0FFH	;BIT CTR=FFFFH? (BUFFER FILLED)?
7203 C21172	02500		JP NZ,NOEOB	;JUMP IF NOT
7206 21FF07	02510		LD HL,2047	;ELSE RESET BIT COUNTER
7209 22F172	02520		LD (BTCTR),HL	
720C 3E01	02530		LD A,1	;SET END-OF-BUFFER FLAG
720E C31272	02540		JP NOEOB2	
7211 AF	02550	NOEOB	XOR A	;RESET END-OF-BUFFER FLAG
7212 324F72	02560	NOEOB2	LD (EOBFLG),A	;STORE EOB FLAG
7215 3AF372	02570		LD A,(BYTCTR)	
7218 3D	02580		DEC A	
7219 32F372	02590		LD (BYTCTR),A	;DECR. BYTE COUNTER
721C 2AEF72	02600	GBP	LD HL,(BYTPTR)	;GET BYTE POINTER
721F CB6C	02610	INSTR	SET 0,(HL)	;THIS OPCODE WAS ALTERED EARLIER
7221 3AF372	02620		LD A,(BYTCTR)	
7224 B7	02630		OR A	
7225 C23472	02640		JP NZ,GBP2	
7228 3E08	02650		LD A,8	;IF ALL BITS IN 1 BUFFER BYTE
722A 32F372	02660		LD (BYTCTR),A	;ARE DONE POINT AT NEXT BYTE
722D 2AEF72	02670		LD HL,(BYTPTR)	
7230 23	02680		INC HL	
7231 22EF72	02690		LD (BYTPTR),HL	
7234 3AAF72	02700	GBP2	LD A,(EOBFLG)	
7237 B7	02710		OR A	;EOB FLAG SET?
7238 CA4A72	02720		JP Z,CHKEND	;JUMP IF NOT
723B 11AF72	02730		LD DE,ODCB	
723E CD3944	02740		CALL 4439H	;ELSE WRITE BUFFER TO DISK
7241 C2CA71	02750		JP NZ,DSKERR	
7244 218876	02760		LD HL,BUFFER	;SET BYTE POINTER TO START
7247 22EF72	02770		LD (BYTPTR),HL	
724A E1	02780	CHKEND	POP HL	;RESTORE REGISTERS USED
724B D1	02790		POP DE	
724C C1	02800		POP BC	
724D F1	02810		POP AF	
724E C9	02820		RET	;EXIT THIS ROUTINE
724F 00	02830	EOBFLG	DEFB 0	
7250 6F	02840	TABLE	DEFB 'o'	
7251 01	02850		DEFB 1	
7252 69	02860		DEFB 'i'	
7253 02	02870		DEFB 2	
7254 6E	02880		DEFB 'n'	
7255 03	02890		DEFB 3	
7256 73	02900		DEFB 's'	
7257 04	02910		DEFB 4	
7258 72	02920		DEFB 'r'	
7259 05	02930		DEFB 5	
725A 68	02940		DEFB 'h'	
725B 06	02950		DEFB 6	
725C 6C	02960		DEFB '1'	
725D 07	02970		DEFB 7	
725E 64	02980		DEFB 'd'	
725F 08	02990		DEFB 8	
7260 63	03000		DEFB 'c'	
7261 09	03010		DEFB 9	
7262 75	03020		DEFB 'u'	
7263 0A	03030		DEFB 10	
7264 6D	03040		DEFB 'm'	
7265 0B	03050		DEFB 11	
7266 66	03060		DEFB 'f'	
7267 0C	03070		DEFB 12	
7268 70	03080		DEFB 'p'	
7269 0D	03090		DEFB 13	
726A 67	03100		DEFB 'g'	
726B 0E	03110		DEFB 14	
726C 77	03120		DEFB 'w'	
726D 0F	03130		DEFB 15	
726E 00	03140	CHAR	DEFB 0	
0040	03150	IDCB	DEFS 64	
0040	03160	ODCB	DEFS 64	
72EF 0000	03170	BYTPTR	DEFW 0	
72F1 0000	03180	BTCTR	DEFW 0	
72F3 00	03190	BYTCTR	DEFW 0	
0100	03200	CPTBL	DEFS 256	
0100	03210	CPTBL2	DEFS 256	
74F4 00	03220	SWFLG	DEFB 0	
74F5 00	03230	TEMP	DEFB 0	
74F6 00	03240	TEMP2	DEFB 0	
74F7 0A	03250	IMSG	DEFB 0AH	
74F8 4E	03260		DEFW 'NAME OF FILE TO BE COMPRESSED' =	
74F9 41				
74FA 4D				
74FB 45				
74FC 20				
74FD 4F				
74FE 46				
74FF 20				
7500 46				
7501 49				
7502 4C				
7503 45				

Listing 1 continued

Listing 1 continued

```

7504 20
7505 54
7506 4F
7507 20
7508 42
7509 45
750A 20
750B 43
750C 4F
750D 4D
750E 50
750F 52
7510 45
7511 53
7512 53
7513 45
7514 44
7515 20
7516 3D
7517 20
7518 03
7519 0A0A 03270 DEFB 03
03280 MSG DEFW 0A0AH
03290 DEFM 'NAME OF NEW FILE = '
751C 41
751D 4D
751E 45
751F 20
7520 4F
7521 46
7522 20
7523 4E
7524 45
7525 57
7526 20
7527 46
7528 49
7529 4C
752A 45
752B 20
752C 3D
752D 20
752E 03
03300 DEFB 03
03310
03320 ;CLOSE BOTH FILES
03330 CLOSE LD DE,IDCB
03340 CALL 4428H ;CLOSE INPUT FILE
03350 JP NZ,DSKERR
03360 LD DE,ODCB
03370 CALL 4439H ;WRITE REMAINING BYTES TO OUTPUT
03380 JP NZ,DSKERR
03390 LD DE,ODCB
03400 CALL 4428H ;CLOSE OUTPUT FILE
03410 JP NZ,DSKERR
03420 LD A,0DH
03430 CALL 33H
03440 JP 402DH ;EXIT TO DOS
7552 4771 03450 MODS DEFW CH1+1
7554 5271 03460 DEFW GCHAR3+1
7556 6071 03470 DEFW GCHAR4+1
7558 7171 03480 DEFW GCHAR5+1
755A 5072 03490 DEFW TABLE
755C 5272 03500 DEFW TABLE+2
755E 5472 03510 DEFW TABLE+4
7560 5672 03520 DEFW TABLE+6
7562 5872 03530 DEFW TABLE+8
7564 5A72 03540 DEFW TABLE+10
7566 5C72 03550 DEFW TABLE+12
7568 5E72 03560 DEFW TABLE+14
756A 6072 03570 DEFW TABLE+16
756C 6272 03580 DEFW TABLE+18
756E 6472 03590 DEFW TABLE+20
7570 6672 03600 DEFW TABLE+22
7572 6872 03610 DEFW TABLE+24
7574 6A72 03620 DEFW TABLE+26
7576 6C72 03630 DEFW TABLE+28
0100 03640 IBUFFR DEFS 256
0010 03650 DEFS 16
0100 03660 BUFFER DEFS 256
7000 03670 END ENTRY
00000 Total Errors

```

End

Program Listing 2. Decompress program.

```

00100 ;*****
00110 ;# "DCOMPRS" TEXT DE-COMPRESSOR
00120 ;# VERSION 2.1
00130 ;# Copyright 1984 by Stewart F. Hunter
00140 ;*****
00150 ;
7000 00160 ORG 7000H
7000 CDC901 00170 START CALL 01C9H ;CLEAR THE SCREEN
7003 AF 00180 XOR A ;INITIALIZE
7004 326B71 00190 LD (EOFLG),A ;END OF FILE FLAG
7007 3E01 00200 LD A,1
7009 326A71 00210 LD (RBFLAG),A ;READ-BUFFER FLAG
700C 3E07 00220 LD A,7
700E 326971 00230 LD (LMB),A
7011 212E72 00240 LD HL,IMSG
7014 CD1B02 00250 CALL 21BH
7017 21AE71 00260 LD HL,IDCB

```

Listing 2 continued

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701C CD4080
701P 215272
7022 CD1B02
7025 21EET71
7028 0618
702A CD4000
702D 215573
703B 11AE71
7033 0601
7035 CD2444
7038 C26872
703B 3E81
703C 32B771
7048 216574
7043 FD216574
7047 11EET71
704A 0608
704C CD2044
704F C26872
7052 0613
7054 216C71
7057 C5
7058 E5
7059 11AE71
705C CD3644
705F C26872
7062 E1
7063 C1
7064 23
7065 10F0
7067 0613
7069 DD21.0071
706D 116C71
7070 CD7E70
7073 0604
7075 116C71
7078 CD7E70
707B C3BE70
707E DDE000
7081 DD6601
708A 1A
7085 77
7086 DD23
7088 DD23
708A 13
7088 10F1
708D C9
708C CDEB72
7091 3A6B71
7094 FE01
7096 CA7072
7099 3A6771
709C FE20
709E CA1F71
70A1 PE65
70A3 CA1F71
70A6 FE74
70A8 CA1F71
70AB FE61
70AD CA1F71

70B0 21A971
70B3 1E82
70B5 060F
70B7 3A6771

70BA 1600
70BC BE
70BD CAC670
70C0 19
70C1 10F9
70C3 21FFFF

70C6 7C
70C7 A5
70C8 FE5F
70CA CADD570

70CD 23
70CE 7E
70CF 326771
70D2 C31F71
70D5 31F570
70D8 B7
70D9 C2EC70
70DC 0608
70DE CD3273
70E1 3A6771
70E4 FE04
70E6 CA7072
70E9 C31F71
70EC 21F570
70EF CD1B02
70F2 C37072
70F5 0A
70F6 2A
70F7 2A
70F8 20
70F9 44
70FA 45
70FB 43
70FC 4F
70FD 44

```

LD B,24
CALL 40H          ;INPUT LINE INTO (HL)
LD HL,OMSG
CALL 21BH
LD HL,ODCB
LD B,24
CALL 40H          ;INPUT LINE INTO (HL)
LD HL,IBUFFR
LD DE,IDCB
LD B,1
CALL 4424H        ;OPEN INPUT FILE
JP NZ,DSKERR
LD A,1
LD (IDCB+9),A     ;MAKE LRL = 1
LD HL,BUFFER
LD IY,BUFFER      ;INITIALIZE IY POINTER
LD DE,ODCB
LD B,0
CALL 4420H        ;CREATE OUTPUT FILE
JP NZ,DSKERR
LD B,19
LD HL,CFTBL2
PUSH BC
PUSH HL
LD DE,IDCB
CALL 4436H
JP NZ,DSKERR
POP HL
POP BC
INC HL
DJNZ RD19LP
LD B,19
LD IX,MODS
LD DE,CFTBL2
CALL MODIFY
LD B,4
LD DE,CFTBL2
CALL MODIFY
JP MAINLP
LD L,(IX)
LD H,(IX+1)
LD A,(DE)
LD (HL),A
INC IX
INC IX
INC DE
DJNZ MODIFY
RET
CALL GETCHR       ;GET AN ENCODED CHAR. FROM INPUT
LD A,(EOFGL)
CP 1              ;END OF INPUT FILE?
JP Z,CLOSE        ;CLOSE FILES IF SO
LD A,(OCHAR)
CP ' '            ;PUT CHAR READ INTO A REG.
                     ;IS IT A SPACE?
JP Z,WRTCHR
CP 'e'            ;IS IT e?
JP Z,WRTCHR
CP 't'            ;IS IT t?
JP Z,WRTCHR
CP 'a'            ;IS IT a?
JP Z,WRTCHR
IF CHARACTER=0 THRU w
LD HL,TABLE       ;TABLE OF CHAR. AND CODES
LD E,2            ;# OF BYTES/TABLE ENTRY
LD B,15           ;# OF ENTRIES IN TABLE
LD A,(OCHAR)
                     ;= SEARCH CHAR.
H TABLE FOR CHAR.
LD D,0
CP (HL)
JP Z,SREND        ;JUMP IF CHAR FOUND
ADD HL,DE
DJNZ SRCH
LD HL,-1          ;FLAG FOR NOT FOUND
AR. FOUND IT'S ADRS IS IN HL,ELSE HL=-1
LD A,H
AND L
CP BFFH
JP Z,ESCGRP       ;JUMP IF CHAR NOT 0 THRU w
IS IN 0 THRU w GRP SO WRITE ASCII CODE TO BUFFER
INC HL            ;HL POINTS TO ASCII CODE
LD A,(HL)
LD (OCHAR),A      ;PUT ASCII CODE INTO OCHAR
JP WRTCHR         ;GO WRITE IT TO OUTPUT FILE
LD A,(OCHAR)
                     ;CHAR.= ESC CODE (00)?
OR A
JP NZ,CODERR      ;JUMP IF NOT ESC. CODE
LD B,8
CALL GCLP         ;ELSE, READ NEXT 8 BITS TO OCHAR
LD A,(OCHAR)
CP 4              ;IS IT END OF FILE CODE?
JP Z,CLOSE        ;IF SO, CLOSE FILES
JP WRTCHR         ;ELSE SEND TO OUTPUT FILE
LD HL,ERRMSG
CALL 21BH
JP CLOSE
DEFB 0AH
DEFW *** DECODING ERROR ***

```


Listing 2 continued

```

70FE 49
70FF 4E
7100 47
7101 20
7102 45
7103 52
7104 52
7105 4F
7106 52
7107 20
7108 2A
7109 2A
710A 0A      01240      DEFB 0AH
710B 20      01250      DEFB 'ABORTING PROGRAM'
710C 41
710D 42
710E 4F
710F 52
7110 54
7111 49
7112 4E
7113 47
7114 20
7115 50
7116 52
7117 4F
7118 47
7119 52
711A 41
711B 4D
711C 0A      01260      DEFB 0AH
711D 03      01270      DEFB 03
              01280      ;WRITE AN ASCII CHARACTER TO THE OUTPUT FILE
              01290      CNTR      DEFB 0      ;OUTPUT BUFFER COUNTER
711E 00
711F 216771   01300      WRTCHR      LD HL,OCHAR
7122 7E      01310      LD A,(HL)
7123 FD7700   01320      LD (IX),A
7126 CD3300   01330      CALL 33H
7129 FD23     01340      INC IX
712B 3A1E71   01350      LD A,(CNTR)
712E 3C      01360      INC A
712F 321E71   01370      LD (CNTR),A
7132 FE00     01380      CP 0
7134 2010     01390      JR NZ,SKIP
7136 216574   01400      LD HL,BUFFER
7139 11EE71   01410      LD DE,ODCB
713C CD3944   01420      CALL 4439H      ;WRITE BUFF TO OUTPUT FILE
713F C26872   01430      JP NZ,DSKERR
7142 FD216574 01440      LD IX,BUFFER      ;RESET BUFFER POINTER
7146 C38E70   01450      SKIP             ;GO DECODE NEXT CHARACTER
7149 01      01460      TABLE      DEFB 1
714A 6F      01470      DEFB 'o'
714B 02      01480      DEFB 2
714C 69      01490      DEFB 'i'
714D 03      01500      DEFB 3
714E 6E      01510      DEFB 'n'
714F 04      01520      DEFB 4
7150 73      01530      DEFB 's'
7151 05      01540      DEFB 5
7152 72      01550      DEFB 'r'
7153 06      01560      DEFB 6
7154 68      01570      DEFB 'h'
7155 07      01580      DEFB 7
7156 6C      01590      DEFB 'l'
7157 08      01600      DEFB 8
7158 64      01610      DEFB 'd'
7159 09      01620      DEFB 9
715A 63      01630      DEFB 'c'
715B 0A      01640      DEFB 10
715C 75      01650      DEFB 'u'
715D 0B      01660      DEFB 11
715E 6D      01670      DEFB 'm'
715F 0C      01680      DEFB 12
7160 66      01690      DEFB 'e'
7161 0D      01700      DEFB 13
7162 70      01710      DEFB 'p'
7163 0E      01720      DEFB 14
7164 67      01730      DEFB 'g'
7165 0F      01740      DEFB 15
7166 77      01750      DEFB 'w'
7167 00      01760      OCHAR      DEFB 0
7168 00      01770      IBYTE      DEFB 0
7169 07      01780      LMB        DEFB 7
716A 00      01790      RBFLAG     DEFB 0
716B 00      01800      EOFGL      DEFB 0
0014        01810      CFTBL2     DEFS 20
7180 9D70     01820      MODS      DEFW CH1+1
7182 A270     01830      DEFW CH2+1
7184 A770     01840      DEFW CH3+1
7186 AC70     01850      DEFW CH4+1
7188 4A71     01860      DEFW TABLE+1
718A 4C71     01870      DEFW TABLE+3
718C 4E71     01880      DEFW TABLE+5
718E 5071     01890      DEFW TABLE+7
7190 5271     01900      DEFW TABLE+9
7192 5471     01910      DEFW TABLE+11
7194 5671     01920      DEFW TABLE+13
7196 5871     01930      DEFW TABLE+15
7198 5A71     01940      DEFW TABLE+17
719A 5C71     01950      DEFW TABLE+19
719C 5E71     01960      DEFW TABLE+21
719E 6071     01970      DEFW TABLE+23
71A0 6271     01980      DEFW TABLE+25
71A2 6471     01990      DEFW TABLE+27

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Listing 2 continued

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Listing 2 continued

```

71A4 6671      02000      DEFW TABLE+29
71A6 FE72      02010      DEFW CH5+1
71A8 0D73      02020      DEFW CH6+1
71AA 1C73      02030      DEFW CH7+1
71AC 2B73      02040      DEFW CH8+1
0040           02050      IDCB      DEFS 64
0040           02060      ODCB      DEFS 64
722E 0A        02070      IMSG      DEFB 0AH
722F 4E        02080      DEFM 'NAME OF FILE TO BE DECOMPRESSED = '
7230 41
7231 4D
7232 45
7233 20
7234 4F
7235 46
7236 20
7237 46
7238 49
7239 4C
723A 45
723B 20
723C 54
723D 4F
723E 20
723F 42
7240 45
7241 20
7242 44
7243 45
7244 43
7245 4F
7246 4D
7247 50
7248 52
7249 45
724A 53
724B 53
724C 45
724D 44
724E 20
724F 3D
7250 20
7251 03
7252 0A0A      02090      DEFB 03
7254 4E        02100      OMSG      DEFW 0A0AH
7255 41        02110      DEFM 'NAME OF NEW FILE = '
7256 4D
7257 45
7258 20
7259 4F
725A 46
725B 20
725C 4E
725D 45
725E 57
725F 20
7260 46
7261 49
7262 4C
7263 45
7264 20
7265 3D
7266 20
7267 03
7268 F6C0      02120      DEFB 03
726A CD0944    02130      DSKERR    OR 0C0H
726D C32D40    02140      CALL 4409H
02150          JP 402DH
02160
7270 11AE71    02170      CLOSE     LD DE,IDCB      ;CLOSE BOTH FILES
7273 CD2844    02180      CALL 4428H
7276 C26872    02190      JP NZ,DSKERR
7279 216574    02200      LD HL,BUFFER
727C 11EE71    02210      LD DE,ODCB
727F CD3944    02220      CALL 4439H      ;WRITE REMAINING BYTES TO OUTPUT
7282 C26872    02230      JP NZ,DSKERR
7285 11EE71    02240      LD DE,ODCB
7288 CD2844    02250      CALL 4428H
728B C26872    02260      JP NZ,DSKERR
728E 3E0D      02270      LD A,0DH
7290 CD3300    02280      CALL 33H
7293 C32D40    02290      JP 402DH      ;JUMP TO DOS
02300          ;SUBROUTINE GETS 1 BIT FROM INPUT FILE. RETURNS WITH
02310          ;Z FLAG SET FOR ZERO, RESET FOR ONE. CARRY FLAG IS
02320          ;SET IF EOF WAS READ.
02330          LD A,(RBFLAG)      ;TIME TO READ ANOTHER BYTE
02340          CP 1              ;FROM INPUT?
02350          JP NZ,GETLMB      ;JUMP IF NOT
02360          LD HL,IBYTE      ;READ 1 BYTE FROM INPUT FILE
02370          LD DE,IDCB      ;TO IBYTE
02380          CALL 4436H
02390          JP Z,INITL      ;JUMP IF NO ERROR
02400          CP 28            ;EOF READ?
02410          JP NZ,DSKERR
02420          SCF              ;SET CARRY IF EOF
02430          RET              ;EXIT THIS ROUTINE
02440          LD A,7
02450          LD (LMB),A
02460          XOR A
02470          LD (RBFLAG),A
02480          LD A,46H
02490          LD (INS+1),A      ;INITIALIZE 'BIT b,(HL)' INSTR.
02500          LD A,(LMB)
02510          SLA A
02520          SLA A

```

Listing 2 continued

Listing 2 continued

```

72C6 CB27      02530      SLA A
72C8 21D172    02540      LD HL,INS+1      ;MODIFY OPCODE AT INS+1
72CB B6        02550      OR (HL)
72CC 77        02560      LD (HL),A      ;INSERT BIT # TO BE TESTED
72CD 216871    02570      LD HL,IBYTE
72D0 CB46      02580      BIT 0,(HL)      ;TEST STATE OF BIT IN IBYTE
72D2 F5        02590      PUSH AF      ;SAVE BIT'S STATE IN Z
72D3 3A6971    02600      LD A,(LMB)      ;DECR. BIT #
72D6 3D        02610      DEC A
72D7 326971    02620      LD (LMB),A
72DA F2E772    02630      JP P,GETST      ;JUMP IF LMB IS NOT -1
72DD 3E07      02640      LD A,7      ;ELSE SET LMB TO 7
72DF 326971    02650      LD (LMB),A
72E2 3E01      02660      LD A,1
72E4 326A71    02670      LD (RBFLAG),A
72E7 F1        02680      GETST POP AF      ;RESTORE BIT STATE
72E8 37        02690      SCF
72E9 3F        02700      CCF      ;RESET CARRY
72EA C9        02710      RET      ;EXIT THIS ROUTINE
              02720      ;GET 1 ENCODED CHARACTER FROM INPUT FILE. CHAR IS
              02730      ;RETURNED IN OCHAR. EOFLG EQUALS 1 IF END OF FILE
              02740      ;OF INPUT FILE IS READ.
72EB AF        02750      GETCHR XOR A
72EC 326771    02760      LD (OCHAR),A
72EF CD9672    02770      CALL GETBIT
72F2 DA4F73    02780      JP C,GCHRA
72F5 3E00      02790      LD A,0
72F7 326B71    02800      LD (EOFLG),A
72FA CA0373    02810      JP Z,GC1
72FD 3E20      02820      CH5 LD A,' '
72FF 326771    02830      LD (OCHAR),A
7302 C9        02840      RET
7303 CD9672    02850      GC1 CALL GETBIT
7306 DA4F73    02860      JP C,GCHRA
7309 CA1273    02870      JP Z,GC2
730C 3E65      02880      CH6 LD A,'e'
730E 326771    02890      LD (OCHAR),A
7311 C9        02900      RET
7312 CD9672    02910      GC2 CALL GETBIT
7315 DA4F73    02920      JP C,GCHRA
7318 CA2173    02930      JP Z,GC3
731B 3E74      02940      CH7 LD A,'t'
731D 326771    02950      LD (OCHAR),A
7320 C9        02960      RET
7321 CD9672    02970      GC3 CALL GETBIT
7324 DA4F73    02980      JP C,GCHRA
7327 CA3073    02990      JP Z,GC4
732A 3E61      03000      CH8 LD A,'a'
732C 326771    03010      LD (OCHAR),A
732F C9        03020      RET
7330 0604      03030      GC4 LD B,4
7332 C5        03040      GCLP PUSH BC
7333 CD9672    03050      CALL GETBIT
7336 DA4B73    03060      JP C,GCLPX
7339 F5        03070      PUSH AF
733A E1        03080      POP HL
733B 7D        03090      LD A,L
733C 07        03100      RLCA
733D 07        03110      RLCA
733E 6F        03120      LD L,A
733F E5        03130      PUSH HL
7340 F1        03140      POP AF
7341 3F        03150      CCF
7342 216771    03160      LD HL,OCHAR
7345 CB16      03170      RL (HL)
7347 C1        03180      POP BC
7348 10E8      03190      DJNZ GCLP
734A C9        03200      RET      ;EXIT THIS ROUTINE
734B C1        03210      GCLPX POP BC
734C C34F73    03220      JP GCHRA
734F 3E01      03230      GCHRA LD A,1
7351 326B71    03240      LD (EOFLG),A
7354 C9        03250      RET
0100          03260      Ibuffr DEFS 256
0010          03270      DEFS 16
0100          03280      BUFFER DEFS 256
7000          03290      END START
00000 Total Errors

```

End

Tidbit #23

Even when you modify Model I Scripsit to run on a Model III, the two versions' text files aren't completely compatible. Because of differences in the way each version stores a disk file's sector count in its directory entry, modified Model I Scripsit drops 256 bytes when it reads a Model III Scripsit file.

To restore these bytes, use a disk-zap program like Super Utility to read the directory. Find the text file's directory entry and increase relative byte 14's value by 1. This makes modified Model

I Scripsit think the file has one more sector. Then load Model I Scripsit, load the text file, and resave it. Now both Scripsit versions can read the file. Model III Scripsit will give the error message, "Attempt to read outside of file limits," but you can ignore it.

If you don't have a disk zapper, add 256 spaces, or a little more than four lines, to your Model III Scripsit files.

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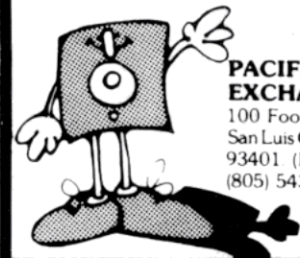
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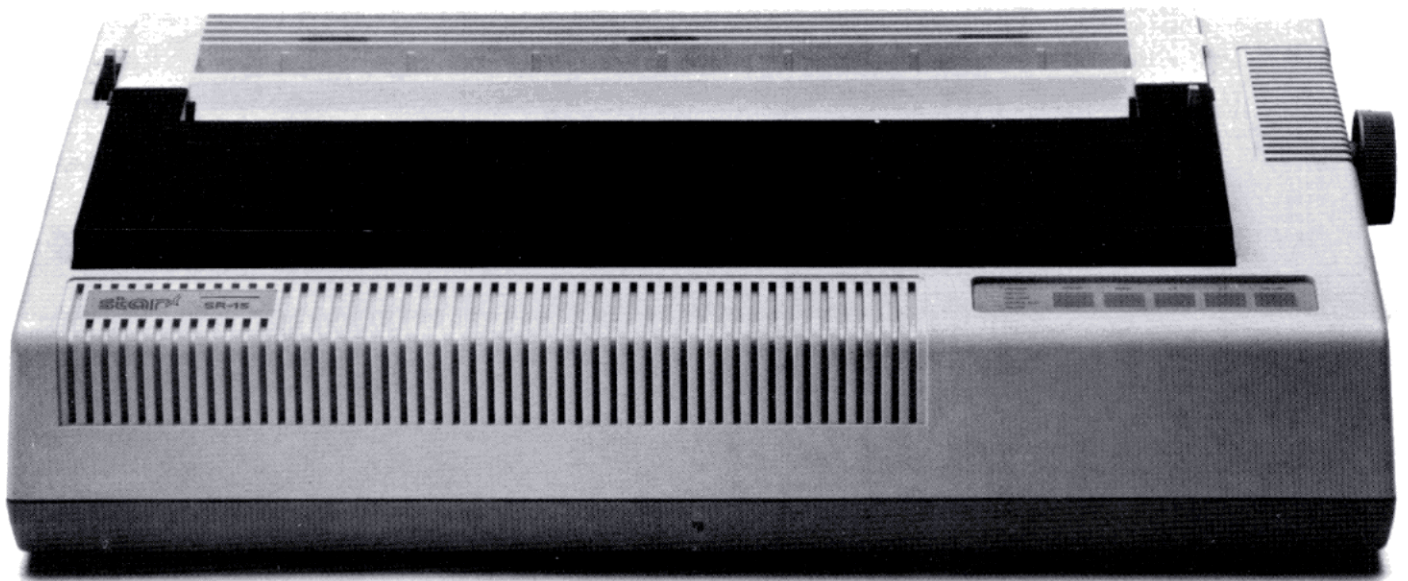
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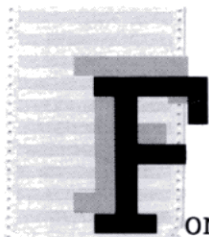
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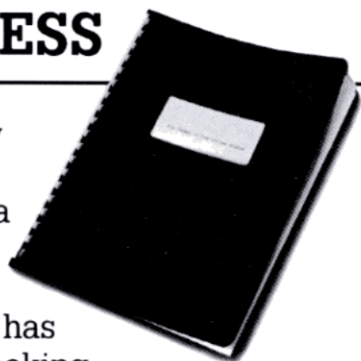


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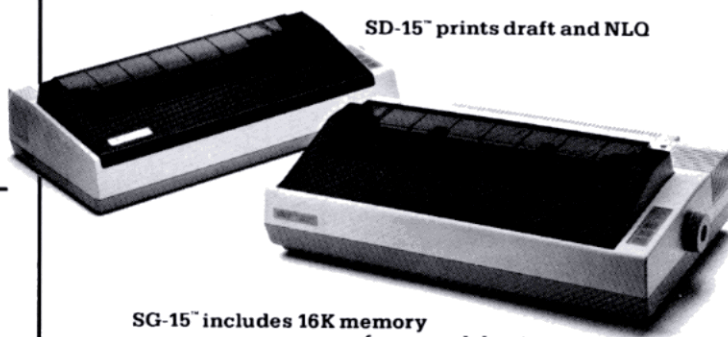
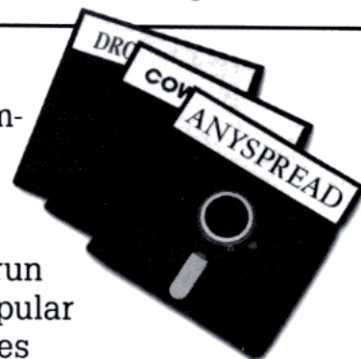
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Time, as the man says, is money. To keep a project within budget you have to bring it in on time. Critical path scheduling (CPS) is a graphing technique that tells a project manager how best to apply his resources to stay on schedule.

My CPS program analyzes a project's subtasks to find those on which the overall schedule depends (see the Program Listing). Using your inputs, the program calculates the time a project will take and produces bar charts that give you a timeline for these critical tasks (see Fig. 1).

The Path to Success

You most often find critical path scheduling applications in the shipbuilding, aerospace, and construction industries, but you can apply the technique to any project that involves completing a series of specific tasks according to a schedule.

As its name indicates, CPS finds a route, or path, through a network of tasks from a project's beginning to its end. This route shows the minimum time it takes to complete the project. Tasks along this path must start on schedule.

As an illustration of critical path scheduling, see the sample program output in Fig. 1. This typical CPS bar chart shows a 60-week construction schedule for an apartment building.

The letter C indicates the project's critical path; any schedule slip along this path delays the entire project. Each C stands for one time unit in the schedule, in this case a week. Building Design, for example, takes eight weeks and must begin the

first week of the project if it's to come in on time.

The letter N indicates a noncritical task that doesn't have to start at the earliest indicated date. The dashes following the N's tell you how long a noncritical task can slip.

For example, hiring subcontractors takes four weeks (see Fig. 1). Hiring can't begin until after four weeks of design. As long as you finish hiring subcontractors by the 20th week, the project's on schedule. So the

project manager has 12 weeks of slack time for this task; he can begin hiring any time from the fourth through the 16th week of the project. This overview helps a manager efficiently use resources by recognizing which tasks he must start on time and which allow some leeway.

Dissecting Your Project

The value of a CPS graph depends on the validity of your task assignments. You

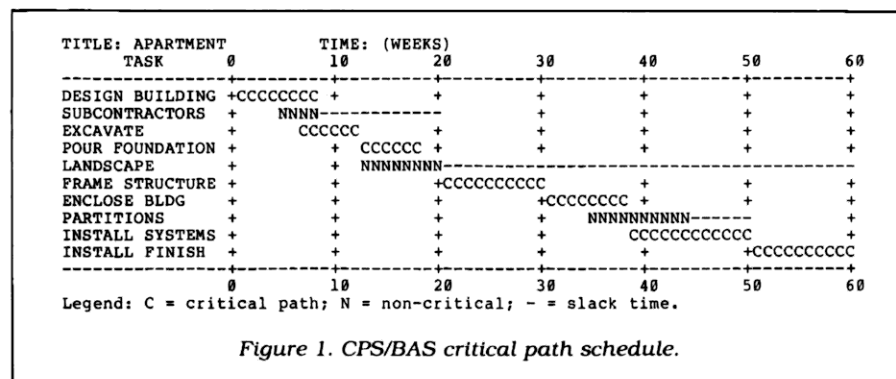


Figure 1. CPS/BAS critical path schedule.

Task ID	Task Name	Task Length (weeks)	Precedence ID	Offset
1000	Design Building	8	0999	0
1010	Subcontractors	4	1000	-4
1020	Excavate	6	1000	2
1030	Pour Foundation	6	1020	0
1040	Landscape	8	1020	0
1050	Frame Structure	10	1010	0
			1030	2
1060	Enclose Building	8	1050	0
1070	Partitions	10	1060	-4
1080	Install Systems	12	1060	0
1090	Install Finish	10	1070	0
			1080	0
9999	Stop	0	1040	0
			1090	0

Table. CPS/BAS input format.



System Requirements

Models I, III, 4, 1000 and 1200
32K RAM
Disk Basic
Printer optional

must break a project down into specific tasks, determine their proper order, and estimate each task's length. Since most projects undergo constant, unpredictable changes, it's often worthwhile to try out a variety of scenarios that bring a project in on time and within budget.

To use my program, you must format these task assignments as shown in the Table. These sample inputs correspond to

the output in Fig. 1.

You should assign each task a four-digit identification (ID) number, a name of up to 15 characters, and a time length. In the Table, the time period is in weeks, but you can use days, months, or any other unit you choose.

Then you must determine precedences, that is, which tasks must precede others. For each task, enter the ID number of any

task that must precede the current task. For example, the Table lists two precedences for Frame Structure: ID 1010 (Subcontractors) and ID 1030 (Pour Foundation).

The offset represents a time relationship between a task and a precedence. As a precedence to framing the structure, hiring subcontractors has an offset of zero weeks, meaning that framing can begin as soon as you've hired the subcontractor.



Photo 1. CPS/BAS main menu.

TASK	LENGTH	EARLY	LATE	SLACK
DESIGN BUILDING	88	0	0	0
SUBCONTRACTORS	84	4	16	12
EXCAVATE	86	6	6	0
POUR FOUNDATION	86	12	12	0
LANDSCAPE	88	12	52	40
FRAME STRUCTURE	10	20	20	0
ENCLOSE BLDG	88	30	30	0
PARTITIONS	10	34	40	6
INSTALL SYSTEMS	12	38	38	0
INSTALL FINISH	10	50	50	0

Photo 2. CPS/BAS parameter table.

```
10 CLEAR:DEFINT A-Z
220 PRINT "<<";TAB(36)"Entry format:";TAB(79)">>";PRINT
"<<";TAB(20)"(L)etter - Hit 'L', ENTER key not required";
TAB(79)">>";PRINT "<<";TAB(31)"Hit CLEAR key to escape";
TAB(79)">>";
230 PRINT "<<";TAB(21)"<ENTER> - ENTER key required for
entry"; TAB(79)">>";
260 PRINT STRING$(40,"<"); STRING$(40,">");:RETURN
570 IF P$="0" THEN 590
1020 PRINT TAB(65)0$;P=P+8;M=M+1;IF M=16 THEN GOSUB 1090;
M=0
2750 PRINT TAB(17)"(Terminate precedence input by 0,0
<ENTER>):PRINT:PRINT:PRINT:PRINT:PRINT:RETURN

Add TAB(10) to all PRINT and PRINT TAB locations. For
example, line 980 should be:
980 PRINT TAB(10) T$; TAB(17) LEFT$(T$(I),4); TAB(14)
RIGHT$(T$(I),LC-4); TAB(44) L$(I);:IF I=1 THEN M=M+1;
PRINT: GOTO 1040
```

Figure 2. Modifications to CPS/BAS for the Models 4 and 1000.

Change the PRINT @ locations by the following table. In some lines, the variable P is assigned the location. On the Model 1000, insert the LOCATE r,c: command before the PRINT and delete the @location. When the P is assigned the location variable, assign P the row location, and Q the column location. For example: P=23;Q=12: LOCATE P,Q:PRINT

Model III	Model 4	Model 1000	
		Row	Column
520	817	12	15
533	830	12	28
535	832	12	30
536	833	12	31
537	834	12	32
654	888	10	18
960	1684	23	15
961	1685	23	16
966	1690	23	21
968	1692	23	23
970	1694	23	25
972	1696	23	22
980	1704	23	26
982	1706	23	28

Figure 3. Additional modifications for the Models 4 and 1000.

Pouring the foundation has an offset to framing the building of two weeks, because the concrete must set for two weeks before framing starts.

If a task can begin while a precedence is in progress, the offset has a negative value. This is illustrated under Partitions (ID 1070): the precedence task, Enclose Building (ID 1060), has an offset of -4, indicating that you can begin partitioning the building four weeks before it's completely enclosed.

You can define tasks and assign ID numbers, lengths, and precedences as you please, with a few minor restrictions. Your first task must use 0999, a dummy number, as a precedence. Your last task must be 9999 Stop, as in the Table.

You must assign all tasks as a precedence somewhere in the schedule; if you haven't assigned a task as a precedence by the end of your list, include it as a precedent under 9999 Stop. In the Table, Landscaping and Installing Finish don't precede any tasks, so they're assigned as precedences under Stop.

Entering Your Data

The program fits in a 32K RAM disk-based system, which gives you a maximum of 40 tasks. If you have a 48K system, you can add capacity for more tasks by modifying the Dimension statement in line 120 for up to 100 tasks. Figures 2 and 3 list modifications for the Models 4 and 1000.

When you load and run the program, it displays the menu shown in Photo 1. To invoke its options (or any submenu options) press the letter key in parentheses; you don't have to press the enter key.

Use the keyboard Data Entry option to type in project information in the format de-

Listing continued

```

830 INPUT #1,PS(L)
840 INPUT #1,LS(L)
850 NEXT:CLOSE:GOSUB 320 :GOSUB 860 :GOTO 40
860 ' ESTABLISH PRECEDENCES & OFFSETS
870 FOR I=2 TO N:P=3:FOR J=1 TO N:P(I,J)=0:NEXT J
880 FOR L=1 TO VAL(LEFT$(PS(I),2)):PS=MID$(PS(I),P,4):GOSUB 710
      P(I,J)=VAL(MID$(PS(I),P+4,4)):P=P+8:NEXT L
890 NEXT I:ON ERROR GOTO 2630 :RETURN
900 ' DISK FILE NAME
910 PH$="":PI$="<ENTER> File name (8 chars. max.): ":P=654:
      PRINT @P,PI$;D=15:GOSUB 410 :PS=D$:RETURN
920 ' FILE MESSAGE
930 PRINT @535,"** FILE NOT FOUND **":GOTO 790
940 ' REVIEW-MODIFY DATA
950 GOSUB 2630 :M=0:FOR I=S TO N
960 P=3:LC=LEN(T$(I)):TS=STR$(I):LL=LEN(T$):
      IF LL=2 THEN TS=" 00"+RIGHT$(TS,1) ELSE IF LL=3 THEN
        TS=" 0"+RIGHT$(TS,2) ELSE TS=" "+RIGHT$(TS,3)
970 IF LC=0 THEN 1040
980 PRINT TS;TAB(7)LEFT$(TS(I),4);TAB(14)RIGHT$(TS(I),LC-4);
      TAB(34)LS(I);IF I=1 THEN M=M+1:PRINT:GOTO 1040
990 PRINT TAB(42)LEFT$(PS(I),2);" ";
1000 P=3:FOR J=1 TO VAL(LEFT$(PS(I),2))
1010 PRINT TAB(47)MID$(PS(I),P,4);:
      OS=STR$(VAL(MID$(PS(I),P+4,4))-5000):
      IF LEN(OS)=2 THEN OS=LEFT$(OS,1)+"0"+RIGHT$(OS,1)
1020 PRINT TAB(55)OS:P=P+8:M=M+1:IF M=12 THEN GOSUB 1050 :M=0
1030 NEXT J:IF I=N THEN GOSUB 1050
1040 NEXT I:GOTO 40
1050 'EDIT OR CONTINUE
1060 PRINT @982,"(E)dit or (C)ontinue?";
1070 GOSUB 290 :IF K$="E" THEN 1100 ELSE IF K$<"C" THEN 1070
      ELSE CLS: S=I
1080 IF I>N THEN GOSUB 2630
1090 RETURN
1100 ' EDIT OPTIONS
1110 GOSUB 390 :PRINT @960,
      "(I)nsert after task, (D)elete task or (E)dit task";
1120 GOSUB 290 :K1$=K$:IF K1$<"I" AND K1$<"D" AND K1$<"E" THEN 1110
1130 PH$="task no. 'N' (3 digits): ":IF K$="I" THEN
      PI$="Insert after " ELSE IF K$="D" THEN PI$="Delete "
      ELSE PI$="Edit "
1140 GOSUB 390 :P=970:D=3:PRINT @P,PI$;PH$;GOSUB 410
      :AN=VAL(D$):AN$=D$
1150 IF K1$="D" THEN 1260 ELSE IF K1$="I" THEN 1100
1160 GOSUB 390 :PRINT @961,"Edit task ";AN$;
      "(N)ame, (L)ength, or (P)recedence(s)+offset(s)?";
1170 GOSUB 290 :IF K$="L" THEN 1310 ELSE IF K$="P" THEN 1350
      ELSE IF K$="N" THEN 1280 ELSE 1160
1180 ' TASK INSERTION
1190 N=N+1:FOR L=N TO AN+2 STEP -1:T$(L)=T$(L-1):L$(L)=L$(L-1):
      PS(L)=PS(L-1):FOR K=N TO 1 STEP -1:P(L,K)=P(L-1,K):NEXT K,L
1200 I=AN+1:T$(I)="" :L$(I)="" :PS(I)="" :FOR K=1 TO N:
      P(I,K)=0:NEXT K:S(I,1)=0:S(I,2)=0
1210 PH$="<ENTER> Task ID+name(4 dgt ID+15 char max)":
      PI$="":P=960:D=19:PRINT @P,PH$;GOSUB 410 :TS(I)=D$
1220 PH$="Input task length (2 digits)":P=972:D=2:
      PRINT @P,PH$;GOSUB 410 :LS(I)=D$
1230 PH$="Input precedence QTY (2 digits)":GOSUB 390 :
      P=970:D=2:PRINT @P,PH$;GOSUB 410 :PS(I)=D$:D0=VAL(D$)
1240 PH$="<ENTER> precedence ID, offset: ":P=961:D=8:
      PRINT @P,PH$;GOSUB 410 :D0=D0-1:L=LEN(D$):
      PS(I)=PS(I)+LEFT$(D$,4):O=VAL(RIGHT$(D$,L-5))+5000:
      PS(I)=PS(I)+RIGHT$(STR$(O),4):IF D0>0 THEN 1240
1250 GOSUB 320 :GOSUB 860 :CLS:GOTO 950
1260 ' TASK DELETION
1270 FOR L=AN TO N-1:T$(L)=T$(L+1):L$(L)=L$(L+1):PS(L)=PS(L+1):
      NEXT L:FOR L=1 TO AN-1:P(AN,L)=0:NEXT L:TS(N)="" :PS(N)="" :
      LS(N)="" :S(AN,1)=0:S(AN,2)=0:N=N-1:CLS:GOTO 950
1280 ' TASK NAME EDIT
1290 GOSUB 390 :PRINT @960,
      "Task: ";AN$;". <ENTER> new name (15 char. max.): ";
      INPUT PI$:TS(AN)=LEFT$(TS(AN),4)+PI$
1300 CLS:GOTO 950
1310 ' TASK LENGTH EDIT
1320 PH$="Length of task ":
      PI$="":Input new length (2 digits):"
1330 GOSUB 390 :PRINT @961,PH$;AN$;" " :LS(AN);PI$;P=968:D=2:
      GOSUB 410 :LS(AN)=D$
1340 CLS:GOTO 950
1350 ' TASK PRECEDENCE EDIT
1360 I=AN:FOR J=1 TO I:P(I,J)=0:NEXT:PH$="For task ";
      PI$="Input precedence QTY (2 digits)"
1370 GOSUB 390 :PRINT @961,PH$;AN$;" " :PI$;P=966:D=2:GOSUB 410
      :PS(I)=D$:D0=VAL(D$)
1380 PI$="<ENTER> precedence ID, offset: ":GOSUB 390:
      P=961:PRINT @P,PH$;AN$;PI$;D=10:GOSUB 410
1390 D0=D0-1:L=LEN(D$):PS(I)=PS(I)+LEFT$(D$,4):
      O=VAL(RIGHT$(D$,L-5))+5000:
      PS(I)=PS(I)+RIGHT$(STR$(O),4):IF D0>0 THEN 1380
1400 P=3:FOR L=1 TO VAL(LEFT$(PS(I),2)):PS=MID$(PS(I),P,4):
      GOSUB 710:P(I,J)=VAL(MID$(PS(I),P+4,4)):P=P+8:NEXT L:
      CLS:GOTO 950
1410 ' COMPUTE EARLY START
1420 GOSUB 320
1430 FOR I=1 TO N
1440 E=0
1450 FOR J=1 TO N
1460 IF P(I,J)=0 OR E=>E(J) THEN 1480
1470 E=E(J)+(P(I,J)-5000)
1480 NEXT J
1490 S(I,1)=E
1500 E(I)=E+VAL(L$(I))
1510 NEXT I:RETURN

```

Listing continued

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```

1520 ' COMPUTE LATE START
1530 FOR J=N TO 1 STEP -1
1540 L=C
1550 FOR I=1 TO N
1560 IF P(I,J)=0 OR L<=S(I,2)+(P(I,J)-5000) THEN 1580
1570 L=S(I,2)-(P(I,J)-5000)
1580 NEXT I
1590 S(J,2)=L-VAL(L$(J))
1600 NEXT J:RETURN
1610 ' WRITE TO DISK
1620 CLS:GOSUB 200 :PRINT @530,"*** Save data on disk? ***";
      GOSUB 900
1630 CLS:PRINT @537,"*** WRITING ***";
1640 OPEN "O",1,FS:N$=STR$(N):PRINT @1,NS
1650 FOR L=1 TO N
1660 PRINT @1,T$(L)
1670 PRINT @1,P$(L)
1680 PRINT @1,L$(L)
1690 NEXT:CLOSE:GOTO 40
1700 ' SCHEDULE PRINT
1710 CLS:PRINT @533,"(S)screen or (P)printer?";:GOSUB 290
1720 IF K$="P" THEN 1980 ELSE IF K$<>"S" THEN 1710
1730 ' Screen print
1740 GOSUB 2350
1750 PRINT TAB(6)"TASK";:FOR K=0 TO C1:PRINT TAB(15+K*10)K*10"C4;
      :NEXT:PRINT:PRINT "-----+";
1760 FOR K=0 TO C1-1:PRINT TAB(17+K*10)"-----+";:NEXT:PRINT
1770 FOR I=2 TO N-1
1780 LC=LEN(T$(I))
1790 PRINT RIGHT$(T$(I),LC-4);TAB(16)"+";
1800 K=S(I,1):GOSUB 2310
1810 IF S(I,1)-S(I,2)<>0 THEN 1820 ELSE 1900
1820 IF K>S(I,1)+VAL(L$(I))-1 THEN 1860
1830 IF K/C4=INT(K/C4) THEN PRINT TAB(17+K/C4)"N";
1840 K=K+1
1850 GOTO 1820
1860 IF K>S(I,2)+VAL(L$(I))-1 THEN 1940
1870 IF K/C4=INT(K/C4) THEN PRINT TAB(17+K/C4)"-";
1880 K=K+1
1890 GOTO 1860
1900 IF K>S(I,1)+VAL(L$(I))-1 THEN 1940
1910 IF K/C4=INT(K/C4) THEN PRINT TAB(17+K/C4)"C";
1920 K=K+1
1930 GOTO 1900
1940 GOSUB 2260 :PRINT
1950 NEXT I:PRINT "-----+";:FOR K=0 TO C1-1:
      PRINT TAB(17+K*10)"-----+";:NEXT:PRINT
1960 PRINT "C = critical path; N = non-critical; - = slack time"
1970 GOSUB 270 :GOTO 120
1980 ' Line printer
1990 GOSUB 2350 ' heading subroutine
2000 LPRINT TAB(6)"TASK";:FOR K=0 TO C1:LPRINT TAB(15+K*10)K*10"C4;
      :NEXT:LPRINT
2010 LPRINT "-----+";
2020 FOR K=0 TO C1-1
2030 LPRINT TAB(17+K*10)"-----+";
2040 NEXT K:LPRINT
2050 FOR I=2 TO N-1
2060 LC=LEN(T$(I))
2070 LPRINT RIGHT$(T$(I),LC-4);TAB(16)"+";
2080 K=S(I,1):GOSUB 2310 :
      IF (S(I,1)-S(I,2))<>0 THEN 2090 ELSE 2170
2090 IF K>S(I,1)+VAL(L$(I))-1 THEN 2130
2100 IF K/C4=INT(K/C4) THEN LPRINT TAB(17+K/C4)"N";
2110 K=K+1
2120 GOTO 2090
2130 IF K>S(I,2)+VAL(L$(I))-1 THEN 2210
2140 IF K/C4=INT(K/C4) THEN LPRINT TAB(17+K/C4)"-";
2150 K=K+1
2160 GOTO 2130
2170 IF K>S(I,1)+VAL(L$(I))-1 THEN 2210
2180 IF K/C4=INT(K/C4) THEN LPRINT TAB(17+K/C4)"C";
2190 K=K+1
2200 GOTO 2170
2210 GOSUB 2260 :LPRINT
2220 NEXT I
2230 LPRINT "-----+";:FOR K=0 TO C1-1:
      LPRINT TAB(17+K*10)"-----+";:NEXT:LPRINT
2240 FOR K=0 TO C1:LPRINT TAB(15+K*10)K*10"C4;:NEXT:LPRINT
2250 LPRINT
      "Legend: C = critical path; N = non-critical; - = slack time."
      :LPRINT:LPRINT:GOTO 120
2260 ' POSTSCHEDULE MARKERS
2270 IF K/C4>(C1*10) THEN 2310
2280 FOR L=10 TO C1*10 STEP 10
2290 IF K/C4<L THEN IF K$="P" THEN LPRINT TAB(L+16)"+"; ELSE
      PRINT TAB(L+16)"+";
2300 NEXT L:RETURN
2310 ' PRESCHEDULE MARKERS
2320 FOR L=10 TO C1*10 STEP 10
2330 IF K/C4>L-1 THEN IF K$="P" THEN LPRINT TAB(L+16)"+"; ELSE
      PRINT TAB(L+16)"+";
2340 NEXT L:RETURN
2350 ' CHART TITLE
2360 CLS:PRINT @520,"";:INPUT "<ENTER> Chart title:";C$
2370 CLS:PRINT @520,"";:
      INPUT "<ENTER> Time units:(weeks, hrs. etc.);";T$
2380 IF (K$="P" AND C>60) OR (K$="S" AND C>40) THEN C3=INT(C/2+.5)
      ELSE C3=C
2390 C1=INT(C3/10+.9):C4=INT(C/C3+.5):C5=C4
2400 POKE 16916,0:CLS
2410 IF K$="S" THEN PRINT "TITLE: ";C$;TAB(25)"TIME: (";T$;)" ELSE
      LPRINT "TITLE: ";C$;TAB(25)"TIME: (";T$;)"
2420 RETURN

```

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```

2430 ' PRINT PARAMETER TABLE
2440 CLS:PRINT @533,"(S)creen or (P)rinter?";:GOSUB 290
2450 IF K$="P" THEN 2530 ELSE IF K$<"S" THEN 2440
2460 ' Screen print
2470 GOSUB 2680 :FOR I=2 TO N-1
2480 LC=LEN(T$(I))
2490 PRINT TAB(1)RIGHT$(T$(I),LC-4);TAB(24)LS(I);
      TAB(34)S(I,1);TAB(45)S(I,2);TAB(56)S(I,2)-S(I,1)
2500 IF I>N-1 AND (I-1)/10=INT((I-1)/10) THEN GOSUB 270 :GOSUB 2680
2510 NEXT I
2520 GOSUB 270 :GOTO 120
2530 ' Line Printer
2540 PH$="### PARAMETERS ###":LPRINT TAB(22)PH$:GOSUB 2350
2550 LPRINT TAB(34)"<---STARTS--->"
2560 LPRINT TAB(6)"TASK";TAB(22)"LENGTH";TAB(34)"EARLY";
      TAB(45)"LATE";TAB(56)"SLACK"
2570 LPRINT "-----";TAB(21)"-----";
      TAB(33)"-----";TAB(44)"-----";TAB(55)"-----"
2580 FOR I=2 TO N-1
2590 LC=LEN(T$(I))
2600 LPRINT TAB(1)RIGHT$(T$(I),LC-4);TAB(24)LS(I);
      TAB(34)S(I,1);TAB(45)S(I,2);TAB(56)S(I,2)-S(I,1)
2610 NEXT I
2620 LPRINT:LPRINT TAB(20)"Time of completion:";STR$(C);
      " time units.":LPRINT:LPRINT:LPRINT:GOTO 120
2630 ' EDIT/REVIEW HEADING
2640 CLS:PRINT " <----- TASK (N) ----->";
      TAB(43)"PRECEDENCE(S)"
2650 PRINT " (N)";TAB(6)"ID NO.";TAB(20)"NAME";TAB(32)"LENGTH";
      TAB(41)"QTY ID NO.";TAB(54)"OFFSET"
2660 PRINT " ---";TAB(7)"---";TAB(14)"-----";
      TAB(32)"-----";TAB(41)"---";TAB(54)"-----"
2670 S=1:FOR Y=0 TO 5:SET(1,Y):SET(76,Y):NEXT:RETURN
2680 ' PARAMETER TABLE HEADING
2690 CLS:PRINT "<";TAB(23)"### PARAMETERS ###";TAB(63)">";:
      GOSUB 250
2700 PRINT "TIME OF COMPLETION:";STR$(C);" time units";
      TAB(34)"<---STARTS--->"
2710 PRINT TAB(6)"TASK";TAB(22)"LENGTH";TAB(34)"EARLY";
      TAB(45)"LATE";TAB(56)"SLACK"
2720 PRINT "-----";TAB(21)"-----";
      TAB(33)"-----";TAB(44)"-----";TAB(55)"-----";
      RETURN
2730 ' START/STOP MESSAGE
2740 CLS:PRINT TAB(26)"*** NOTE ***:IF I>2 THEN PRINT TAB(12)
      "Your last task entered must be 9999STOP" ELSE PRINT TAB(4)
      "Your first precedence ID NO. must be 0999 and 0 offset"
2750 PRINT TAB(7)
      "(Terminate precedence input by pressing <ENTER>):"
      PRINT:PRINT:PRINT:PRINT:RETURN
  
```

End

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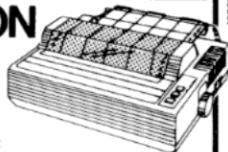


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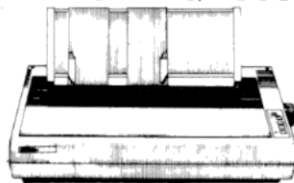
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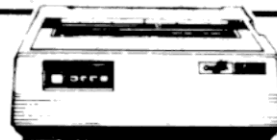
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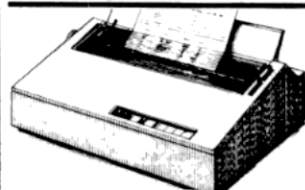
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MUTUAL UNDERSTANDING

TRS-80-compatible editor/assemblers aren't as different as you might think. With some work, they can read each other's files.

Sometimes it seems that software file formats are like fingerprints: No two are alike. Try and get Multiplan to read a VisiCalc file, for example. When software authors design features such as DOS structures and file formats, many often think their ideas best and disregard what others have done. Software compatibility has been practically nonexistent.

I find this problem most evident in the source code editor/assemblers produce; different editor/assemblers write different source programs, some of them incompatible with one another. To set the record straight, I'll detail the differences among TRS-80-compatible editor/assemblers and provide tables of editor/assembler file formats and compatibility.

Incompatibilities

When you must work with source code files produced by many different editor/assemblers, file incompatibility can be a constant irritation. If you're thinking of buying an editor/assembler, your first question might be, "Will it read the files I've already written?"

Luckily, most editor/assemblers can read and write files in several different formats, so you can move from one to another without much difficulty (see Table 1). Some demand that you indicate what format you want to read, others automatically detect an input file's format and adjust accordingly.

When two editor/assemblers are incompatible, you need some way to translate files from one format to another. Generally, it's easy to write a short Basic program to do so, but you need to know what file format each assembler uses in its default mode. I've compiled such information in Table 2; Table 3 lists editor/assembler manufacturers.

In the Beginning: EDTASM

The EDTASM supplied with NEWDOS/80 2.1 was the first popular disk-based editor/assembler for the Model I. Apparat merely altered Radio Shack's tape-based EDTASM so

Editor/ Assembler	File Formats						
	EDTASM	Series 1	M-ZAL	EDAS IV Pro-Create ALDS	ALE	Zen	MACRO-80
ALDS		R		R/W	R		
ALE	R	R	R	R/W	R/W	R	R
EDAS IV	R/W	R/W		R/W	R		R/W
EDTASM	R/W						
INTASM	R/W						
M-ZAL	R/W	R	R/W	R/W			R/W
Pro-Create	R/W	R/W		R/W	R		R/W
Series 1		R/W					
Zen	R	R		R			
Zeus	R/W	R		R/W	R	R	

ALE includes a utility that reads several different file formats. It can only write files in its own formats.

M-ZAL includes a utility program that converts between several different file formats. However, its editor only reads and writes M-ZAL format.

INTASM and Zeus can also read and write files in their own, partially-assembled formats.

Table 1. Editor/assembler compatibility. Although they have different default formats, several editor/assemblers are capable of reading (R) and writing (W) source codes in several different formats.

that it ran in a disk environment. The upgraded EDTASM supplied with NEWDOS/80 2.0 is essentially the same program with a few more bells and whistles.

EDTASM stores source code on disk with exactly the same format as the original EDTASM used on tape. Each file starts with a 7-byte identification field. Then it stores each line, along with its line number, in a quasi-ASCII format. A control-Z character (1A hexadecimal [hex]) marks the end of the file; this is a standard end-of-file marker in many different operating systems on many different computers.

The EDTASM identification field, found at the beginning of a file, is a byte of 0D3 hex followed by six characters of the file name (padded on the right with ASCII spaces). This ID field is necessary on tape so the tape loader can identify a file anywhere on a cassette; it is unnecessary on a disk file and no

assembler uses it except EDTASM.

Each line of EDTASM source code begins with a five-digit ASCII line number with the high bit of each byte set. Therefore, the number for line 00210, for example, is stored as B0 B0 B2 B1 B0 (all in hex) instead of the conventional 30 30 32 31 30 that would appear in a normal ASCII file. An ASCII space (20 hex) always follows the line number and text of the line. Each line ends with a carriage return character, 0D hex.

A Slight Improvement: Series 1 Editor/Assembler

Radio Shack's Series 1 Editor/Assembler produces source code files 7 bytes shorter than EDTASM, but this change only makes files produced by the two programs incompatible.

The biggest difference is that Series 1 files don't begin with an identification field. Also,

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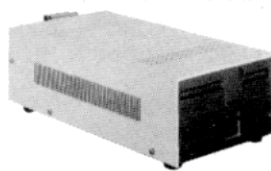
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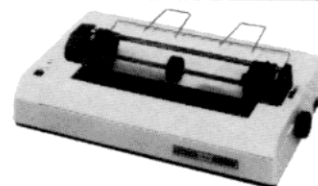
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instead of a space after each line number, the Series 1 inserts a tab character (09 hex). Except for those two minor differences, Series 1 and EDTASM files are identical.

Both EDTASM and Series 1 file formats are inefficient; an assembler doesn't need to save source code line numbers, especially in a 5-byte ASCII form, because the assembler doesn't use those numbers. Therefore, the authors of other editor/assemblers have sought more economical ways to store source code in disk files.

The Most Unusual: M-ZAL

The M-ZAL editor/assembler produces the most unusual source code and its for-

mat is the most difficult to change. The first 2 bytes of an M-ZAL source file contain the length of the file plus 5CFO hex in normal least-significant byte/most-significant byte (LSB/MSB) order. This unusual number is not arbitrary; it's the address of M-ZAL's text buffer.

M-ZAL stores each line of source code with the line number condensed to 2 bytes (again in LSB/MSB integer form) followed by a single byte containing the length of the line. Because it stores the line length in the file, M-ZAL doesn't need (and doesn't store) a carriage return at the end of each line. Each M-ZAL file ends with 2 bytes of OFF hex, to indicate an impossible line

number of FFFF hex (or 65535 decimal).

The result is that an M-ZAL file is somewhat shorter than its EDTASM equivalent. M-ZAL saves 4 bytes per line, plus 4 bytes in its header, but uses an extra byte to mark the end of the file.

The ASCII Difference: EDAS IV, Pro-Create, ALDS, ALE, and Zen

Most of the other popular editor/assemblers have dispensed with line numbers entirely in their storage format. EDAS IV, Pro-Create, and ALDS use identical formats: They store what you type into the editor exactly as an ASCII word processor

Original source program (saved as TEST/SRC). I modified this program to fit the syntax of ALDS and Zen.

```
00100 :A Short Text Program
00110      ORG      6000H
00120 START  LD      HL,(8000H)
00130      LD      A,L
00140      END
```

Assembler	File Header	Line Header	Line Text	File Terminator
ALDS (69 bytes)	none		:A_Short_Test_Program OD % PSECT % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	1A
ALE (66 bytes)	none		:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	
EDAS IV (67 bytes)	none		:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	1A
EDTASM (Apparat) (104 bytes)	D3 TEST__	B0 B0 B1 B0 B0 __ B0 B0 B1 B1 B0 __ B0 B0 B1 B2 B0 __ B0 B0 B1 B3 B0 __ B0 B0 B1 B4 B0 __	:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	1A
M-ZAL (80 bytes)	3C 5D	64 00 15 6E 00 0A 78 00 13 82 00 07 8C 00 04	:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) % LD % A,L % END	FF FF
Pro-Create (67 bytes)	none		:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	1A
Series 1 (97 bytes)	none	B0 B0 B1 B0 B0 % B0 B0 B1 B1 B0 % B0 B0 B1 B2 B0 % B0 B0 B1 B3 B0 % B0 B0 B1 B4 B0 %	:A_Short_Test_Program OD % ORG % 6000H OD START % LD % HL,(8000H) OD % LD % A,L OD % END OD	1A

Table 2. Editor/assembler file formats. Here are the default file formats for each editor/assembler for the short program shown at the top of the box. For clarity, ASCII spaces are shown as underlines (__) and tab characters are listed as percent signs (%). All other nonalphabetic characters appear as hexadecimal values.

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DESCRIPTION

- 1 RULE78 Interest Apportionment by Rule of the 78's
- 2 ANNU1 Annuity computation program
- 3 DATE Time between dates
- 4 DAYYEAR Day of year a particular date falls on
- 5 LEASEINT Interest rate on lease
- 6 BREAKVEN Break-even analysis
- 7 DEPRSL Straightline depreciation
- 8 DEPRSY Sum of the digits depreciation
- 9 DEPRDB Declining balance depreciation
- 10 DEPRDDB Double declining balance depreciation
- 11 TAXDEP Cash flow vs. depreciation tables
- 12 CHECK2 Prints NIBS checks along with daily register
- 13 CHECKBK1 Checkbook maintenance program
- 14 MORTGAGE/A Mortgage amortization table
- 15 MULTMON Computes time needed for money to double, triple, etc.
- 16 SALVAGE Determines salvage value of an investment
- 17 RRVARIN Rate of return on investment with variable inflows
- 18 RRCONST Rate of return on investment with constant inflows
- 19 EFFECT Effective interest rate of a loan
- 20 FVAL Future value of an investment (compound interest)
- 21 PVAL Present value of a future amount
- 22 LOANPAY Amount of payment on a loan
- 23 REGWITH Equal withdrawals from investment to leave 0 over
- 24 SIMPDISK Simple discount analysis
- 25 DATEVAL Equivalent & nonequivalent dated values for oblig.
- 26 ANNUDEF Present value of deferred annuities
- 27 MARKUP % Markup analysis for items
- 28 SINKFUND Sinking fund amortization program
- 29 BONDVAL Value of a bond
- 30 DEPLETE Depletion analysis
- 31 BLACKSH Black Scholes options analysis
- 32 STOCVAL1 Expected return on stock via discounts dividends
- 33 WARVAL Value of a warrant
- 34 BONDVAL2 Value of a bond
- 35 EPSEST Estimate of future earnings per share for company
- 36 BETAALPH Computes alpha and beta variables for stock
- 37 SHARPE1 Portfolio selection model-i.e. what stocks to hold
- 38 OPTWRITE Option writing computations
- 39 RTVAL Value of a right
- 40 EXPVAL Expected value analysis
- 41 BAYES Bayesian decisions
- 42 VALPRINF Value of perfect information
- 43 VALADINF Value of additional information
- 44 UTILITY Derives utility function
- 45 SIMPLEX Linear programming solution by simplex method
- 46 TRANS Transportation method for linear programming
- 47 EOQ Economic order quantity inventory model
- 48 QUEUE1 Single server queueing (waiting line) model
- 49 CVP Cost-volume-profit analysis
- 50 CONDPROF Conditional profit tables
- 51 OPTLOSS Opportunity loss tables
- 52 FQOQ Fixed quantity economic order quantity model
- 53 FQEOQWSH As above but with shortages permitted
- 54 FQEOQPB As above but with quantity price breaks
- 55 QUEJECB Cost-benefit waiting line analysis
- 56 NCFANAL Net cash-flow analysis for simple investment
- 57 PROFIND Profitability index of a project
- 58 CAP1 Cap. Asset Pr. Model analysis of project

- 59 WACC Weighted average cost of capital
- 60 COMBAL True rate on loan with compensating bal. required
- 61 DISCBAL True rate on discounted loan
- 62 MERGANA Merger analysis computations
- 63 FINRAT Financial ratios for a firm
- 64 NPV Net present value of project
- 65 PRINDLAS Laspeyres price index
- 66 PRINDPA Passche price index
- 67 SEASIND Constructs seasonal quantity indices for company
- 68 TIMETR Time series analysis linear trend
- 69 TIMEMOV Time series analysis moving average trend
- 70 FUJPRINF Future price estimation with inflation
- 71 MAILPAC Mailing list system
- 72 LETWRT Letter writing system-links with MAILPAC
- 73 SORT3 Sorts list of names
- 74 LABEL1 Shipping label maker
- 75 LABEL2 Name label maker
- 76 BUSBUD DOME business bookkeeping system
- 77 TIMECLK Computes weeks total hours from timeclock info.
- 78 ACCTPAY In memory accounts payable system-storage permitted
- 79 INVOICE Generate invoice on screen and print on printer
- 80 INVENT2 In memory inventory control system
- 81 TELDIR Computerized telephone directory
- 82 TMSUSAN Time use analysis
- 83 ASSIGN Use of assignment algorithm for optimal job assign.
- 84 ACCTREC In memory accounts receivable system-storage ok
- 85 TERMSPAY Compares 3 methods of repayment of loans
- 86 PAYNET Computes gross pay required for given net
- 87 SELLPR Computes selling price for given after tax amount
- 88 ARBCOMP Arbitrage computations
- 89 DEPRSF Sinking fund depreciation
- 90 UPSZONE Finds UPS zones from zip code
- 91 ENVELOPE Types envelope including return address
- 92 AUTOEXP Automobile expense analysis
- 93 INSFILE Insurance policy file
- 94 PAYROLL2 In memory payroll system
- 95 DILANAL Dilution analysis
- 96 LOANAFD Loan amount a borrower can afford
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Ann Arbor, MI 48105

Table 3. Editor/assembler manufacturers.

Using ALDS With 80 Micro Programs

by Hardin Brothers

Most of the Assembly-language programs in *80 Micro* use EDTASM. If you use Radio Shack's Assembly Language Development System (ALDS), you must change 80's listings before you type them in and run them.

All TRS-80 assemblers except ALDS use the ORG directive to initialize the location counter. If you use ALDS, change ORG to PSECT and follow the PSECT with the ORG address in the original program. This one change is all you need to convert programs to ALDS format 95 percent of the time.

Some programs, however, use EDAS and include macro definitions. ALDS supports macros but doesn't follow normal macro labeling conventions, so these programs might create some problems.

You can get around ALDS' macro incompatibility in two ways. If a macro uses a label to jump backwards, your ALDS macro can use DEFL. If the macro definition includes a forward jump to a label, calculate the number of bytes to jump and use \$ + n instead of a label. The examples below should make the process clear; they list each macro definition first in EDAS form, then in ALDS form. ■

;EDAS format:

```
;
FILL MACRO #CHAR,#NUM
LD B,#NUM
FL$ LD (HL),#CHAR
INC HL
DJNZ FL$
ENDM
```

;EDAS format:

```
;
SHIFT MACRO #NUM
LD B,#NUM
SH1$ LD A,(HL)
CP 61H
JR NC,SH2$
SUB 20H
SH2$ INC HL
DJNZ SH1$
ENDM
```

;ALDS format:

```
;
FILL MACRO #0,#1
LD B,#1
FL DEFL $
LD (HL),#0
INC HL
DJNZ FL
ENDM
```

;ALDS format:

```
;
SHIFT MACRO #0
LD B,#0
SH1 DEFL $
LD A,(HL)
CP 61H
JR NC,$+4
SUB 20H
INC HL
DJNZ SH1
ENDM
```

would store it. A carriage return character marks the end of each line and a control-Z marks the end of a file. The file structure doesn't have tricky features such as file headers.

The ALE assembler uses an almost identical file format, except that nothing marks the end of the file (ALE depends on DOS to find the file's end). Finally, the Zen editor uses an ASCII format similar to these others, but doesn't use tab characters. Instead, a single space separates each field of each line, and the assembler is responsible for properly formatting the source code at assembly time. Each Zen file ends with a byte of 00 hex.

Preassembled Files: Instant Assembler and Zeus

Two other popular editor/assemblers store their source files in partially assem-

bled form. Instant Assembler (INTASM) and Zeus preassemble each line as you enter it. As a result, their normal source code files are incompatible with all other editor/assemblers (and with each other), and transforming the files into another format or deciphering them on the disk is next to impossible.

Conclusion

Even if you can load a file from one editor/assembler into another, you might still have to work to make the file assemble properly. Each editor/assembler has its own peculiar syntax, and what works with one will not necessarily work with another. Once you transfer the source code from one assembler to another, you should only need to run a few test assembles and make some small changes. The real difficulty, transferring the source code in the first

place, is a lot easier when you know what each assembler expects. ■

Hardin Brothers is an associate editor and regular columnist for 80 Micro. You can contact him through CompuServe. Go PCS-117 to the Writers' and Editors' Special Interest Group (WESIG) and leave your messages on section zero of the message board. Or write to him at 280 N. Campus Ave., Upland, CA 91786.

Related Articles

Brothers, Hardin. "Making Your Selection: Choosing the Right Editor/Assembler," September 1984, p. 59. An examination of commercial editor/assemblers for the Models I, III, and 4.



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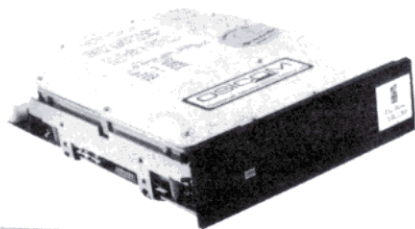
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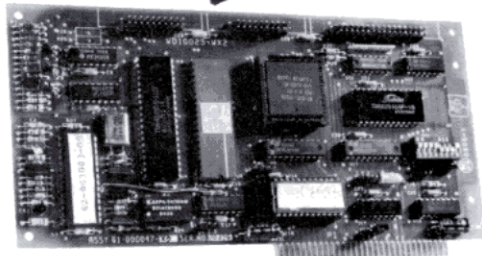
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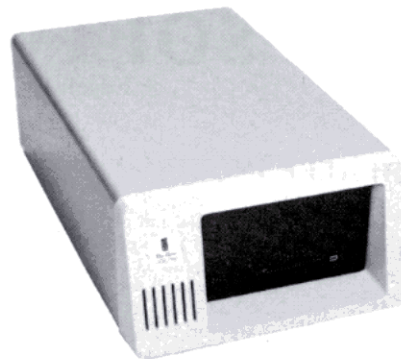
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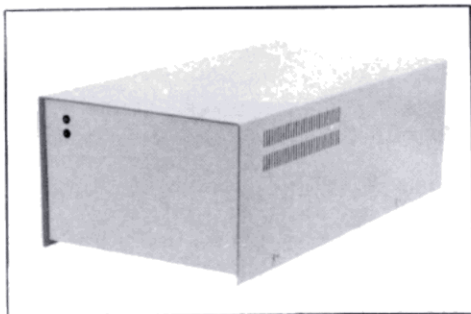
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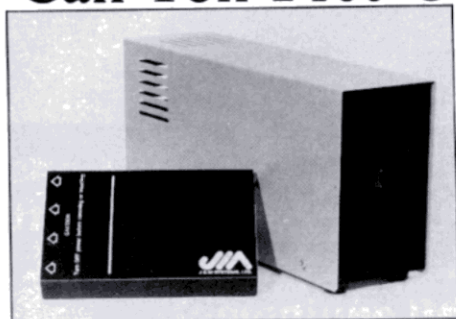
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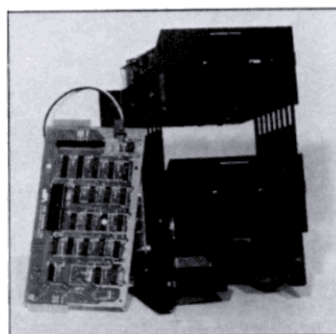
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Power Play: Building Single And Dual Power Supplies

All the projects I've presented here so far require an external power supply. This month, I'll show you how to design and build two types of simple linear power supplies.

Basic Power Supply Design

The block diagram for the basic power supply is shown in Fig. 1. The supply uses a 120-volt ac (alternating current) power source as an input, from which it derives the desired dc (direct current) output voltage.

You need a transformer to step down the 120-volt ac input to get a lower ac voltage. This ac signal then passes through a full-wave rectifier to form an alternating dc signal. Then the dc signal passes through a filter capacitor to smooth it out, creating a steady dc signal (with a slight ac ripple). The dc signal then goes through a voltage regulator to give you the precise voltage you want.

AC, DC, and RMS

Since the ac power input to the transformer is in the form of a sine wave (see Fig. 2), you can measure the voltage in a number of ways. One is to measure the voltage difference between the positive and negative peaks of the sine wave. This is called a peak-to-peak value, and is designated P-P (see Fig. 2).

Another method takes advantage of the fact that the sine wave is symmetric with respect to the X-axis (the horizontal axis). You get the peak voltage by measuring from the zero voltage line (the X-axis) to the top of the positive peak (or the bottom of the negative peak), which represents half the peak-to-peak voltage.

Since the actual voltage of an ac line constantly changes, you may wonder how you get a specific voltage from such a line, like the 120 volts in most homes and businesses. This is done by calculating an

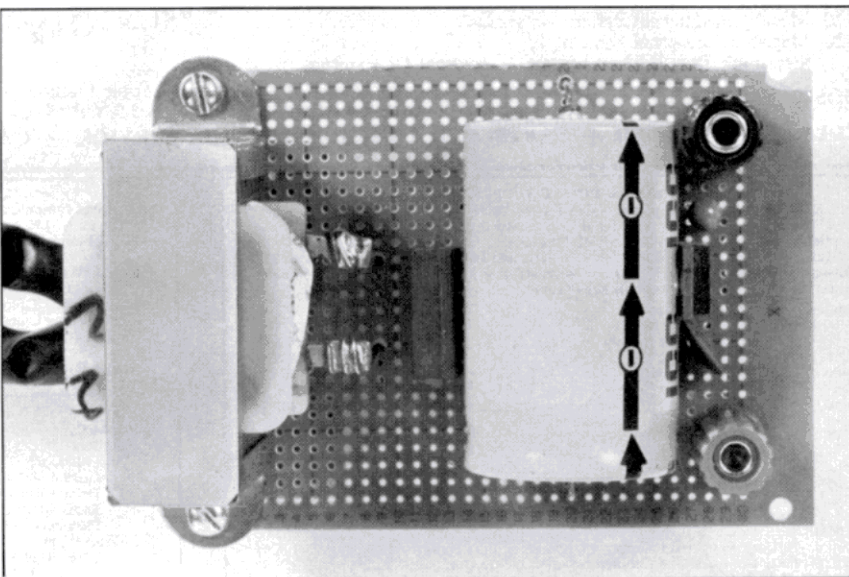


Photo 1. Single power supply.

average or effective voltage value, which you can consider the dc equivalent of the ac value. This is called the root mean square or RMS value. For the simple sine wave signals you will be working with, you can calculate the RMS value by dividing the ac peak voltage by the square root of 2 (see Fig. 2). Unless specified otherwise, all ac voltages refer to the RMS value.

Consider an example. My oscilloscope shows the house ac line at 330 volts peak to peak, so the peak value is half that, or 165 volts. The RMS value is then $165/\text{SQRT}(2) = 116.7$ volts, where $\text{SQRT}(2)$ is the square root of 2. This is well within the acceptable tolerance for my nominal 117-volt line.

The Transformer

Transformers comprise a pair of wire coils wrapped around an iron core. One

coil (the primary) induces a voltage in another (the secondary). You can use either coil as the primary, though most transformers are designed for a specific operation, with the primary predesignated. The ratio of the primary coil voltage to the secondary coil voltage is directly proportional to the ratio of the number of windings of the two coils (see Fig. 3). This allows transformers to step up (increase) or step down (decrease) the input voltage, or to leave the voltage unchanged (for isolation purposes). This project requires a step-down transformer. Note that you can transform only ac signals, not dc signals.

Rectifiers and Rectification

The power supply design calls for some way to change the alternating line current to direct current. The step-down transformer reduces the amplitude (peak-to-peak value) of the ac signal, but the signal

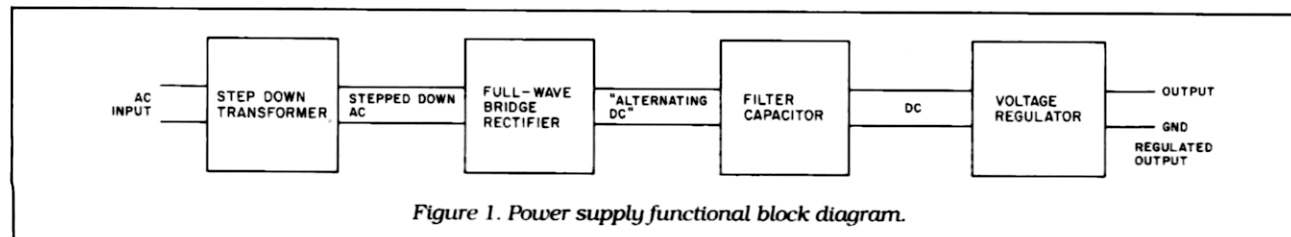


Figure 1. Power supply functional block diagram.

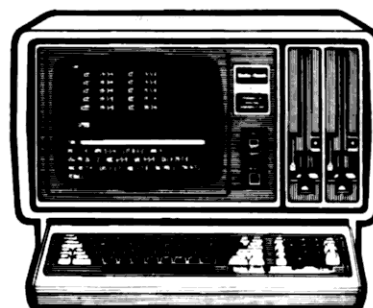
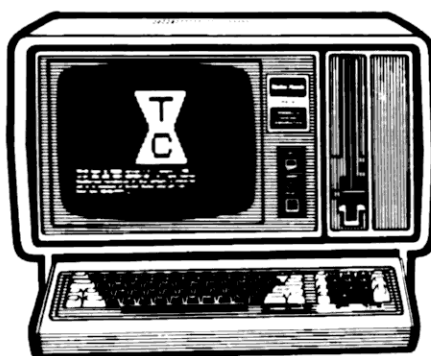
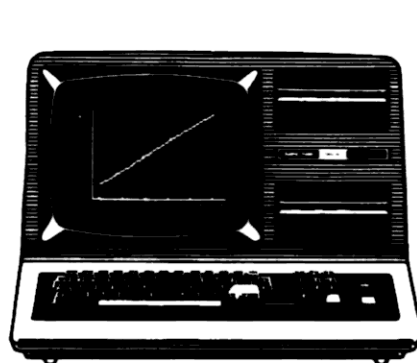
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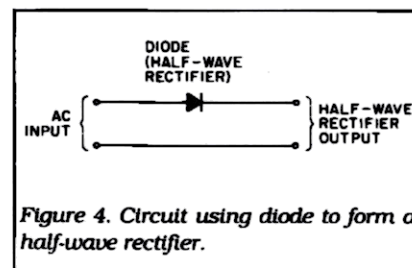
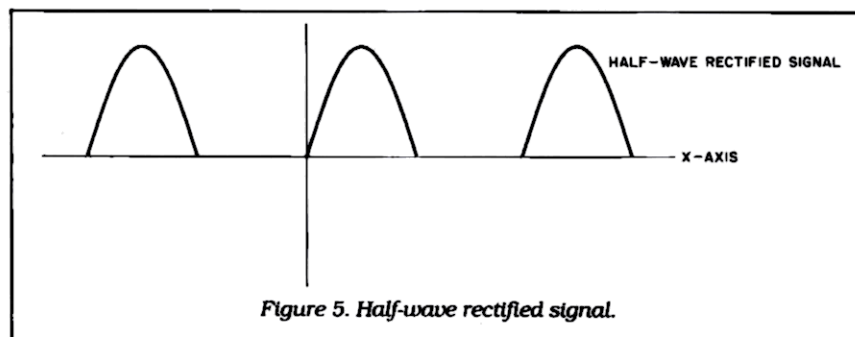
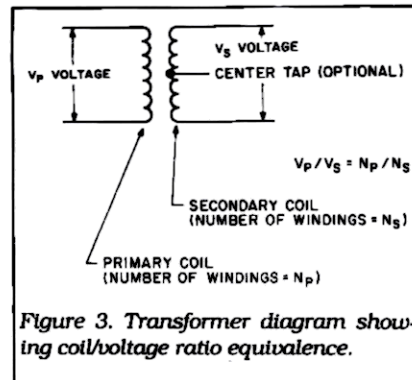
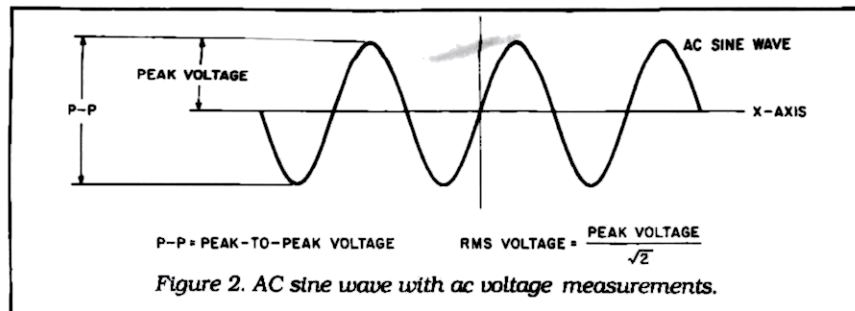
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on the transformer's secondary coil is still an ac sine wave. The next step toward making this a dc value is to rectify the ac signal, that is, to permit only the positive portion of the ac signal to pass through, not the negative portion.

A diode is a simple rectifier that you can use to pass only the positive portion of an ac signal. A simple circuit showing a diode (a half-wave rectifier) in use appears in Fig. 4. The output of the circuit is a half-wave rectified signal, like that shown in Fig. 5

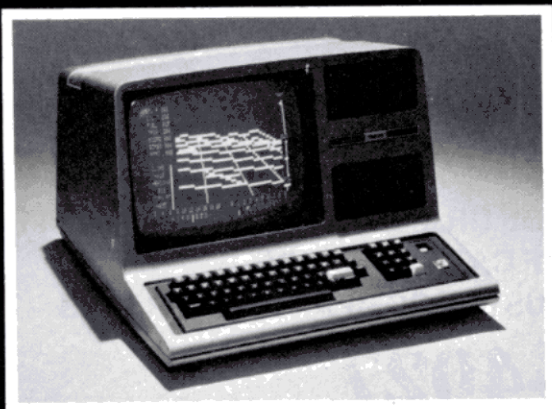
for an ideal diode. The diode passes the positive portions of the ac signal, but suppresses the negative portions; the output is flat (zero volts) during the time the ac signal is in the negative portion of its cycle.

The half-wave rectified output presents



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two disadvantages: First, the repeating hump-space sequence is rather difficult to filter (smooth out). Second, you're not using the energy that is otherwise available in the negative portion of the ac cycle; you're merely suppressing it. It would be better to use a circuit that would get rid of the negative portion of the ac cycle but still make use of it. The answer is to convert the negative voltage to positive.

A circuit that does so, called a full-wave rectifier, appears in Fig. 6. The output of the full-wave rectifier is shown in Fig. 7. The negative portion of the ac cycle is brought above the X-axis to create a repeating hump pattern. This output uses all the energy from the ac signal (except that dissipated in the rectifier circuitry) and allows easier filtering than the half-wave rectifier. Figure 6 shows the full-wave rectifier consisting of four diodes. It is also now available in a single package with four leads: two for the ac inputs, one for the more-negative output, and one for the more-positive output. A drawing of a packaged full-wave rectifier as used in this month's project is shown in Fig. 8.

Filtering

After the full-wave rectifier rectifies the output, the result is what I call an alternating (uneven) dc signal. The next task is to

smooth down the humps to create a smooth dc signal. You do so by putting a filter capacitor across the two output lines of the full-wave rectifier (the minus line and the plus line). This smooths out the signal, creating a dc signal with a small ac ripple. The amount of ripple is inversely proportional to the size of the filter capacitor chosen. Many sensitive computer systems use high-capacitance computer-grade filters (typically 50,000 microfarads or higher) to eliminate ripple and store some power in reserve in case of a brief (a few milliseconds) ac power outage. For your power supply design, however, capacitors of considerably smaller value will do nicely, with almost no detectable ripple.

Voltage Regulator

Once you've filtered the full-wave signal to get a smooth dc signal, you must reduce the voltage down to that desired. (For a linear regulator, the voltage entering the regulator must be at least slightly higher than the desired regulated voltage.) You use a voltage regulator to reduce the voltage. The regulator also insures that the output voltage doesn't change (appreciably) under varying load conditions. Most regulators also have a special safety feature for overload (too much current) or short-circuit protection. When the regu-

lator reaches a certain temperature (due to excessive current draw), it shuts down to prevent damage to the regulator as well as the external circuitry. When it cools to an acceptable temperature, it restores the output.

Linear regulators aren't ideal, however. One problem is that the voltage difference between the input and output represents an internal voltage drop, and is dissipated as heat. For example, if you have an 8-volt input to a 5-volt regulator, a 3-volt voltage drop exists within the regulator. If the external load draws 1 amp of current, 1 amp also goes through the 3-volt drop. Thus, since power = current $\times$ voltage, 1 amp $\times$ 3 volts = 3 watts, which is being lost as heat within the regulator. This heat loss increases as the voltage drop increases, making the regulator much less efficient.

While you can choose among many different kinds of regulators on the market, I will use the simple three-terminal regulators in the 78XX (positive regulator) and 79XX (negative regulator) series. Although they're limited to about 1 amp of current output, they are inexpensive and simple to use. They come in two package types; the TO-3 metal can (see Fig. 9a,c) and the TO-220 plastic package (see Fig. 9b,d). I used the TO-220 package in my supplies, but you can use either. When or-

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dering, the TO-3 package generally has a K suffix (7805K) and the TO-220 generally has a T suffix (7805T). You should note the difference in pinout between the positive and the negative regulators. The schematics specify the input, output and ground pins, and you must connect the correct pins using the pinouts shown in Fig. 9.

To my knowledge, four regulators are available in the 78XX series, three in the 79XX series: 7805, 7806, 7812, 7815, and 7905, 7912, and 7915. The last two digits of the part number indicate the regulated output voltage (the 7812 is a positive 12-volt regulator).

The Design of Dual Supplies

The design of dual power supplies, those with both a positive and a negative voltage of the same magnitude (± 12 volts, for example), is similar to single power supplies. The main difference is the use of a center-tapped transformer and a secondary regulator with twice the voltage used for a single supply. The center tap is a connection at the middle of the secondary coil, brought out for easy access.

The magnitude of the voltage between the center tap and either of the other two secondary output lines is half that of the voltage between the two ends of the secondary coil; the center tap is roughly the half-voltage point. This is used as the ground or zero-volt line in the dual supply, with the negative voltage coming from the minus terminal of the full-wave rectifier and the positive voltage coming from the plus terminal.

Building the Single And Dual Power Supplies

Although I chose a specific output voltage for both the single and the dual supplies, I'll describe the changes necessary for other voltages.

Whenever you work with high voltage, such as the 120-volt ac house current used in this month's project, be careful. Make sure you don't have the power supply plugged in when you're modifying or working on it, and insulate the transformer primary connections once the supply is complete (using electrical tape or putting the supply in an appropriate project box) to keep from accidentally touching them when you're using the supply.

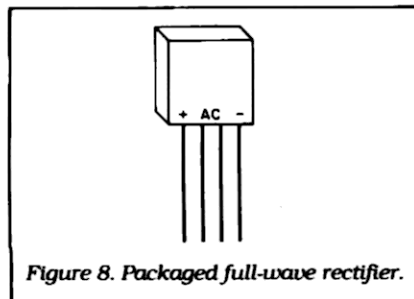


Figure 8. Packaged full-wave rectifier.

The Single Supply

The single power supply is simple to build, having a single positive or negative output voltage (see Photo 1). The schematic for the positive (+5-volt) supply is shown in Fig. 10; the negative (-5-volt) supply is similar and is shown in Fig. 11.

You can change these to other output voltages by changing the transformer and the regulator. The transformer's secondary should be specified for a voltage slightly higher than the desired regulated voltage (by at least a half volt, or so), but not much over, since the excess is dissipated

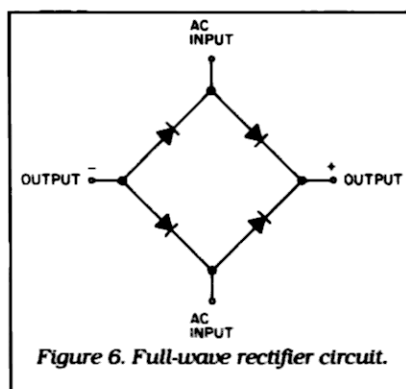


Figure 6. Full-wave rectifier circuit.

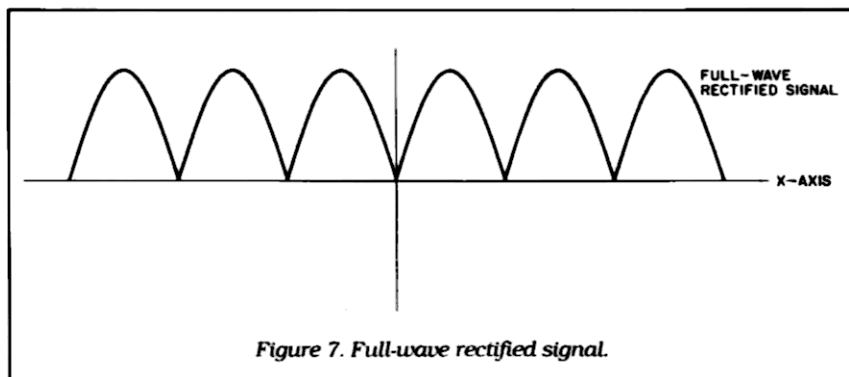


Figure 7. Full-wave rectified signal.

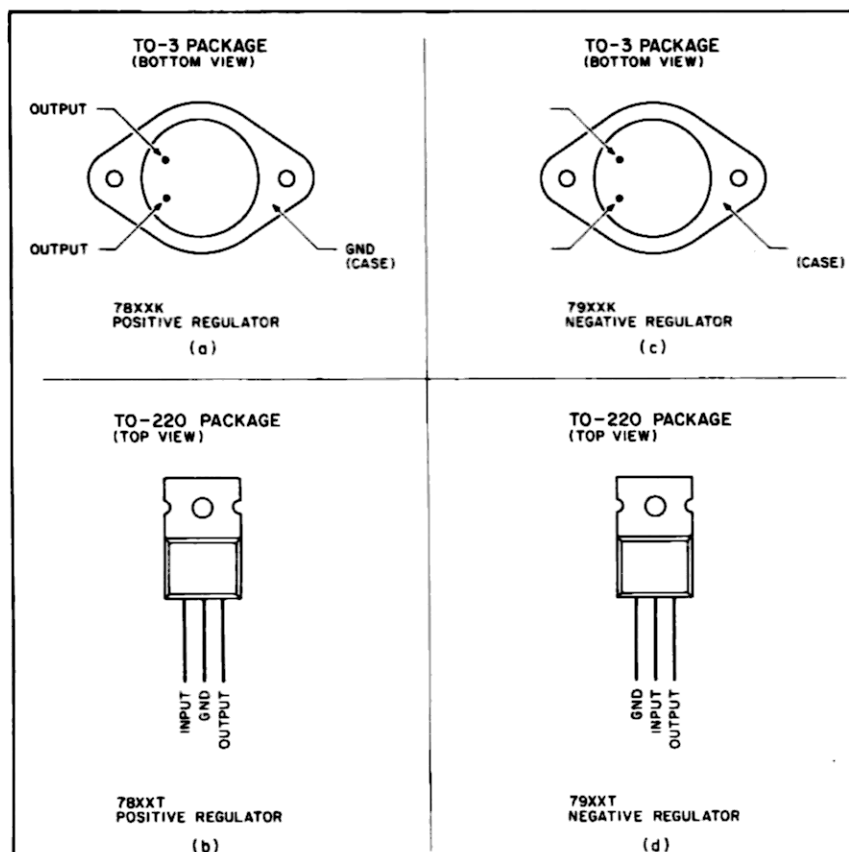


Figure 9. (a) Bottom view of TO-3 78XXK positive regulator. (b) Top view of TO-220 78XXT positive regulator. (c) Bottom view of TO-3 79XXK negative regulator. (d) Top view of TO-220 79XXT negative regulator.

as heat in the regulator. The current rating should also be somewhat greater than the 1 amp allowed by the regulator, since you lose power in the rectification, filtering, and regulation processes. For example, for a ± 12 -volt supply, a transformer with 12.6 volts at 1.5 amps secondary would work.

You should put a heat sink under the regulator (though I didn't use any in my prototypes). It will dissipate the heat generated in the regulator, so that the regulator meets its maximum rated output. When putting the regulator on the sink, use heat sink compound between the regulator and

the sink for better heat transfer.

A fuse on the 120-volt side of the transformer is optional, and is generally not needed since the regulator will shut down before it can draw an excessive amount of current from the transformer.

The Dual Supply

The schematic for the dual supply, consisting of both a positive and negative output of the same magnitude, is shown in Fig. 12 for a ± 12 -volt supply (also see Photo 2). The transformer's center tap serves as the reference (ground or zero-volt) point, and the output voltages are

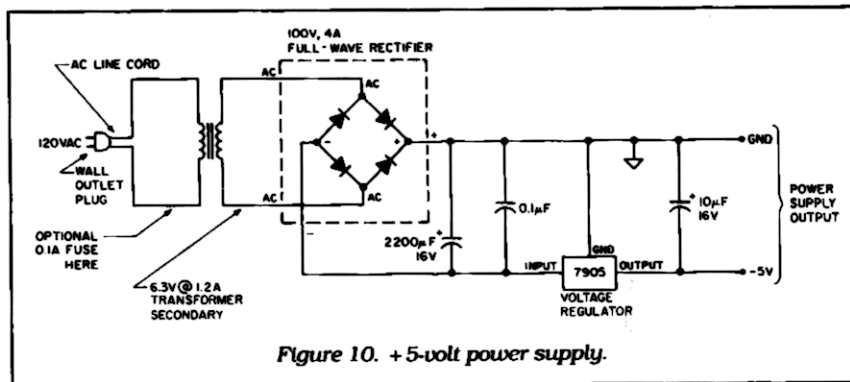


Figure 10. +5-volt power supply.

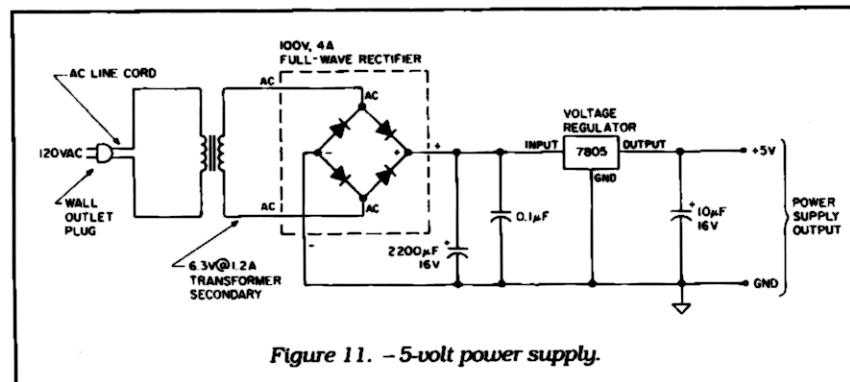


Figure 11. -5-volt power supply.

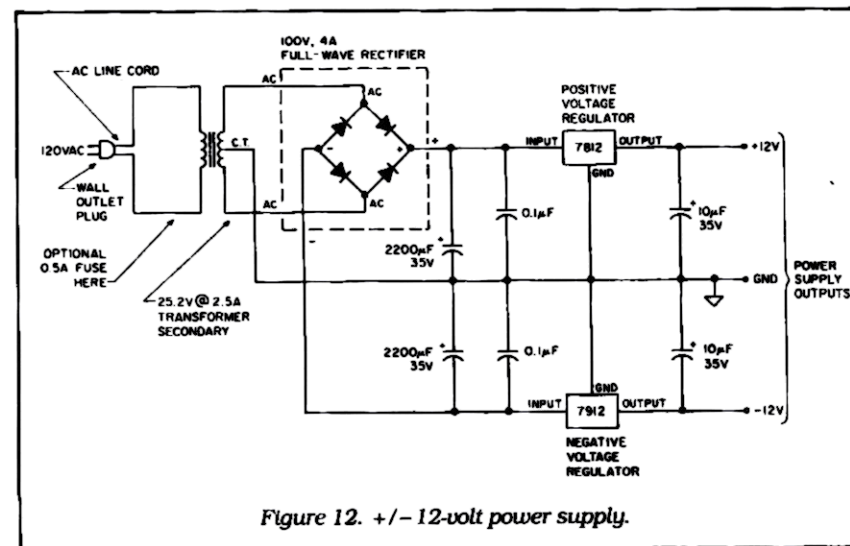


Figure 12. ± 12 -volt power supply.

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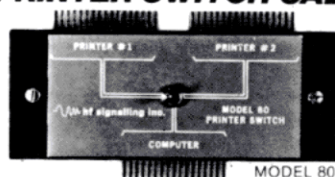
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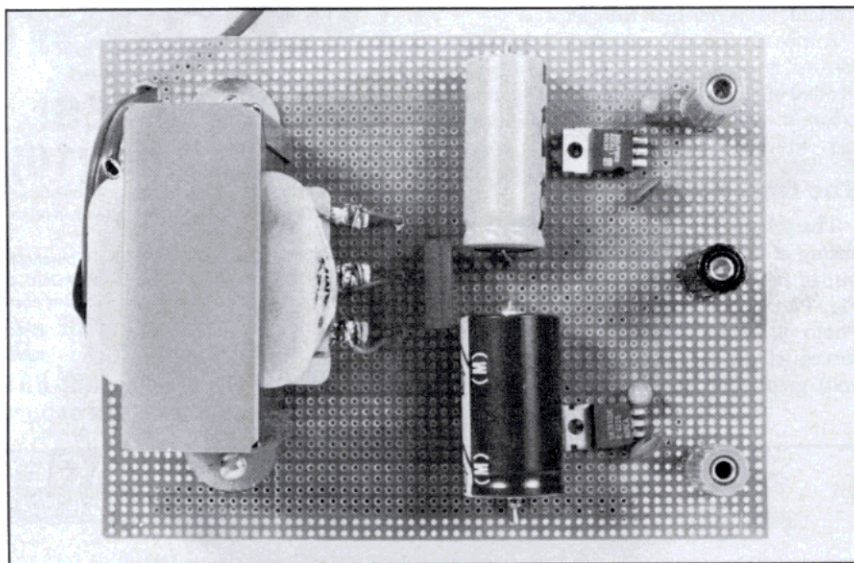


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2-3	Terminal post	RS	274-662	0.70
1	AC plug			
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* See text.

† The 35-volt capacitor from Radio Shack can be substituted for the 16-volt capacitor specified for the + and - 5-volt supplies.

Radio Shack (RS) National Parts Division, 900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662.

Table. Parts list and ordering information.

positive and negative with respect to that line. While the voltage between the minus and plus terminals of the full-wave rectifier is roughly 25.2 volts, it is only half that between the transformer's center tap and either of the two rectifier output terminals.

Alternate Voltages

You can develop other voltage supplies by changing the transformer and the two regulators. The transformer value should be slightly higher than twice the value of the positive output voltage (a 12.6-volt center-tapped transformer works as a ± 5 -volt supply). The current rating on the transformer's secondary should also be higher than the sum of the current output of the two regulators in the supply (for a 1-amp output, the secondary current rating should be 2.5 amps or higher).

As with the single supply described above, you should install heat sinks under the regulators.

Operating the Power Supplies

After connecting the ac line cord to the transformer's primary, and the terminal posts to the supply's regulated output(s), the power supply is ready for use by simply plugging it in. The supplies should provide up to approximately 1 amp of current output for your projects.

Conclusion

I've accumulated quite a collection of supplies over the years due to my various requirements. While the supplies designed here are limited to relatively low current, they can, nonetheless, be used with all of the projects described in the column, as well as ones planned in the future. Enjoy! ■

Write to Roger C. Alford at Washtenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106. Please include a self-addressed, stamped envelope for a reply.

Going Back in Time

In the July 1984 Project 80 (p. 142), I described the construction of a Model III/4 real-time clock. Some people wondered what additional circuitry would be needed to use the real-time clock at the Model 4's full speed.

The schematic for the additional circuitry is shown in Fig. 13. The parts required are listed on the schematic and are available from most of the electronic distributors normally listed in Project 80 (see the Table). You need four new integrated circuits.

You need a crystal (along with three

inverters) to generate an 8-MHz synchronizing clock for the Model III/4 circuitry previously described. If Radio Shack had brought the clock signal out to the input/output (I/O) bus as they should have, you wouldn't need this circuitry.

The 74LS161 4-bit binary counter does most of the work in this new circuit. When you don't have the 58174 selected (Q0/ is high), the master reset pin (MR/, pin 1) is low, clearing the four outputs (Q0-Q3). When you do select the chip, the MR/ pin goes high, allowing the

counter to increment under appropriate conditions. The chip cannot count, however, until both the CEP and CET inputs are high, and the CEP input won't go high until the TRS-80 OUT/ line goes active. When this happens, the chip starts counting, using the rising edge of the 8-MHz clock.

Note that the WR/ line going to the 58174 is no longer the OUT/ line from the TRS-80 bus, but the Q2 line from the 74LS161 (inverted). The flip-flop (74LS74) attached to Q2's output merely serves as an inverter. The 58174 WR/

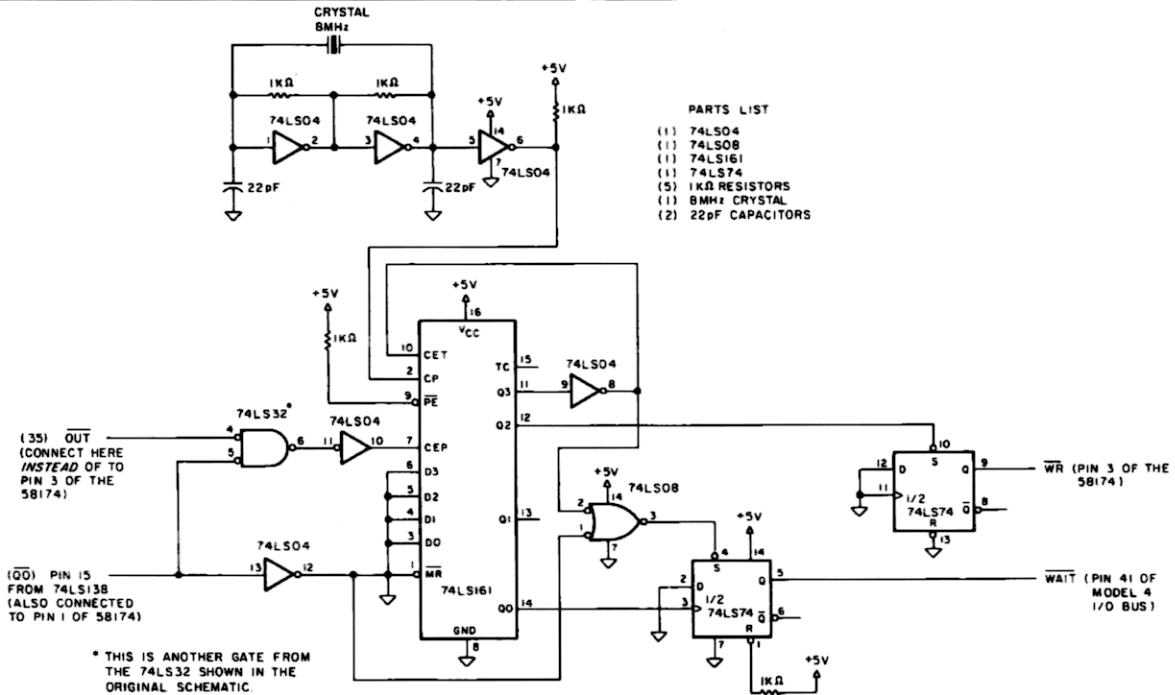


Figure 13. Circuitry to use the real-time clock at the Model 4's full speed.

The ORG should be decremented by 16. For a 48K system it would become:

ORG OFFBOH

The RDTIME routine should become
(without comments):

RDTIME DI

```
LD  A,10H
OUT (0ECH),A
LD HL,TIMTBL
```

•

.

JR NZ,RDTIME

EI

RET

The SETTIME routine should become (without comments):

SETIME DI

```
LD  A,10H
OUT (0ECH),A
XOR A
```

OUT (STPSTR),A

EI

RET

Figure 14. Program changes for Models III/4 to access real-time clock.

line is normally high (as it should be).

On receiving the first rising clock edge after the OUT/ line goes active (while the chip select is also active), the 74LS16 output increments by 1, setting the Q0 output, which in turn sets the flip-flop attached to the Q0 line. The output of this flip-flop goes to the TRS-80 WAIT/ line to generate necessary wait states. Note that no more than 125 nanoseconds (ns), one clock cycle, elapses between the time the OUT/ signal goes active and the time the WAIT/ line goes active (plus a little propagation time). This is well within the time required by the TRS-80's Z80 chip.

Q2 goes high three clock cycles after the WAIT/ goes active, bringing the 58174 WR/ line low. There will be a minimum of 375 ns (three clock cycles) after the chip select goes active before the 58174 WR/ line goes active, which is well above the 310 ns minimum requirement of the 58174. Four clock cycles later, the 58174 WR/ line goes high (Q2 goes low) and the Q3 output goes high, making the WAIT/ line unasserted. The CET line is also brought low, preventing further counting by the 74LS161. Note that the WR/ line is low for approximately 500 ns, well above the 430 ns minimum requirement of the 58174.

Nothing further happens until the chip select is unasserted, reasserting

MR/, clearing the 74LS161's outputs. The whole process is entirely transparent to software. Incidentally, the read timing for the 58174 with the 4 MHz Z80 is already within specs, so modification is not necessary.

Model III/4 Code Change-Break

I also failed to describe the necessary changes to the Assembly-language code for accessing the real-time clock from the Model III/4. These systems require the computer to send a 10H value to the OECH register before each read or write to enable external I/O access. You must also disable the interrupts during this time, since system interrupt service routines often disable external I/O accesses. You should decrement the starting address of the machine-language code because the additional instructions require more room in memory. You should therefore modify the top-of-memory pointer (memory size) accordingly (from OFFCOH to OFFBOH in a 48K system). The RDTIME and SETIME entry points from Basic are also different. For a 48K system, line 80 of the Basic program becomes DEFUSR0=&HFFFB0, while line 90 becomes DEFUSR1=&HFFCC. The program changes required for Model III/4 operation are shown in Fig. 14. ■

A Crash Course In Crash-Proofing

To paraphrase Carl Sandburg, "Why did the children put beans in their ears when the one thing we told them not to do was put beans in their ears?" In other words, why do people sometimes do the opposite of what you tell them to do?

Some people who use your programs will take delight in crashing them or in finding bugs by not following instructions. And people who don't know much about computers are good at crashing programs because they don't know what's acceptable to a program and what isn't.

That's Not Supposed To Happen

My first Basic programs worked perfectly until others tried them. Here's an example from those early days:

```
500 INPUT "Type in a number from 0 to 127
and press enter":X
510 SET (X,30)
```

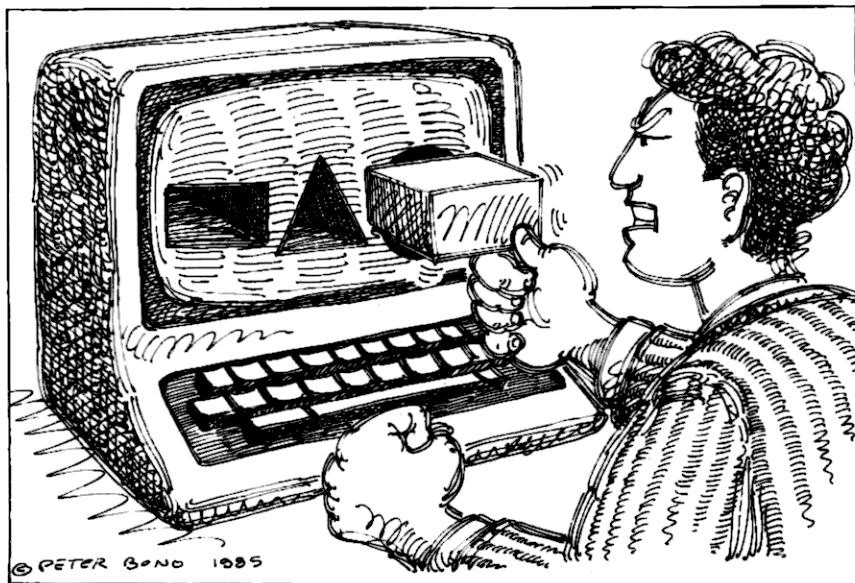
If the user follows instructions, the program sets a pixel on the screen. If not, the program generates an illegal function call (an FC error) because an input value of less than zero or more than 127 is outside the range you can set on the X axis.

As given, the program is correct, but it allows incorrect answers. My lesson: Any program that accepts user decisions must have built-in limits.

One way to pinpoint potential crashes is to focus on every program line offering user decisions (Input and INKEY\$ routines). A Basic program must be a closed environment. You can't let the user step outside the world the program defines, whether he's balancing a checkbook or traversing the terrain of an adventure game.

Limiting Responses

Your computer has the ability to reject one particular kind of unacceptable answer to a prompt. Type in the one-line program 100 INPUT A and try answering it with a character instead of a number. The



computer responds ?REDO (or something similar) until you type in a number. Now try typing in INPUT A\$ and your program accepts any input, but the program treats the entry as a string, not a number.

Here's a simple routine that limits user response to a prompt:

```
100 INPUT "Type in 1 or 2 and press enter":Z
110 IF Z<>1 AND Z<>2 THEN GOTO 100
120 PRINT "You chose ":Z:END
```

The program won't continue until it receives an answer within the acceptable range. A similar routine addresses string input:

```
100 INPUT "Answer YES or NO and press
enter":A$
110 IF A$<>"YES" AND A$<>"NO"
THEN GOTO 100
```

Be careful how you phrase If... Then tests. The logic of IF Z<>1 OR Z<>2 creates a mutually exclusive situation in which neither 1 nor 2 works as a choice.

If you give the user numerous choices, any whole number from 1-100 for example, the form IF Z<>1 and Z<>2 and Z<>3... becomes too unwieldy. Try this:

```
100 INPUT "Type in a whole number from 1 to
100 and press enter":Z
110 Z=INT(Z)
120 IF Z<1 OR Z>100 THEN GOTO 100
130 PRINT "You chose ":Z:END
```

Line 110 corrects the input if the user en-

ters a fractional amount. The program's integer function reduces a fraction to its next lowest whole number: 2.3 becomes 2, for example. Line 120 then accepts the answer if it's in the requested range.

The programming gets trickier when you want to accept some answers and not others. Change line 120 to IF Z/5=INT(Z/5) THEN GOTO 100. Now the program accepts only numbers evenly divisible by five. Similarly, you can rule out some numbers within the accepted range: 120 IF Z=50 OR Z<1 OR Z>100 THEN GOTO 100. This accepts any number from 1-100 except 50. The prompt must clearly state the choices.

Include precise instructions in the prompt. You can also include instructions for what to do if the user registers a wrong answer, as in the following program:

```
100 CLS
110 INPUT "Type in a number, 1 to 5, and press
enter":X
120 X=INT(X)
130 IF X<0 AND X<6 THEN GOTO 190
140 CLS:PRINT "The number you typed is
outside"
150 PRINT "the requested range. Please try
again."
160 PRINT:GOTO 110
170 PRINT "Thanks. That felt good":END
```

Line 130 shunts program execution ahead to line 190 if the answer is legal. If

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BASIC TAKES

the program doesn't accept the answer, lines 150-180 indicate what's wrong and prompt the user for a new entry.

Be careful how you word error messages. Messages like "Wrong, dummy! Try again" sound funny, but they're intimidating, boring, and insulting to the user who's struggling to make a program run correctly. The best style is to blank the screen and present a clearly worded prompt again. If you include more instructions, make them nonjudgmental and encouraging.

You can direct program execution with ON X GOSUB and ON GOTO routines, too:

```
100 CLS:PRINT "MENU"
110 PRINT "1 Branch to line 200."
120 PRINT "2 Branch to line 300."
140 INPUT "Choose 1 or 2 and press enter":X
150 ON X GOTO 200, 300
160 GOTO 100
200 PRINT "You chose line 200." :END
300 PRINT "Here you are at line 300." :END
```

Notice that you haven't limited the input value of X, yet the program doesn't accept menu choices other than 1 or 2. This works because line 150, having two destinations, considers only 1 and 2 as possibilities. If it finds neither, the program falls through to line 160, which restarts the search by returning to line 100.

**Error messages like
"Wrong, dummy!
Try again,"
sound funny, but
they're intimidat-
ing, boring,
and insulting to
the struggling user.**

String Solutions

An INKEY\$ value always represents the string value of the keyboard button most recently pressed. Try this:

```
100 CLS:PRINT "Type in the letter A and press  
enter."
110 A$ = INKEY$
120 IF A$ = "A" THEN PRINT A$
130 GOTO 110
```

Lines 110-130 form a loop with the possible action contained within it. The listing prints the value of A\$ only if you type in the letter A. Best of all, a single keystroke does the job, rather than having to type in the answer and press the enter key:

```
100 CLS:PRINT "Will you continue <Y>es  
or <N>o?"
110 A$ = INKEY$
120 IF A$ <> "Y" AND A$ <> "y" AND A$ <> "N"  
AND A$ <> "n" THEN GOTO 110
130 PRINT "You chose "A$:END
```

Line 120 sends the program back for a new INKEY\$ value if the answer is not a Y, y, N, or n. It works, but you still have a better option: Use INSTR to test for the existence of one string within another. Change line 120 to: IF A\$ = "" OR INSTR("YyNn", A\$) = 0 THEN GOTO 110. The new line is only slightly shorter than the original, but greater space savings and better precision result with five possible responses.

Using INSTR tests can produce problems. The person running your program might tap the correct key in lowercase. An INSTR test doesn't accept an "n" in place of an "N" or vice versa.

Also, allowing these variations puts you in the awkward position of having to consider alternate possibilities each time you test the values in the program. This short routine, put at the start of a program, can solve the problem:

```
100 INPUT "Type in the letter x and press  
enter":X$
110 IF X$ = CHR$(88) THEN PRINT "Keyboard  
must be unshifted so lowercase letters print."  
GOTO 100
120 IF X$ <> CHR$(120) THEN GOTO 100
```

If the user types in the key in uppercase, the program prompts him to respond in lowercase (line 110). In line 120, if the key isn't lowercase, the program loops back for another try. This forces the user to unshift before the program continues. Since all entries are then in lowercase, the program needn't consider uppercase entries as alternatives.

For the last example of delimited responses I'll return to the Input statement. This program accepts numeric and string answers from the same prompt. It treats input as a string, and if the response is a possible numeric value, it uses VAL to create a numeric variable with the numeric value of a string:

```
100 CLS
110 INPUT "Your choices are tango or 1":A$
120 IF A$ = "tango" THEN PRINT "Sorry, I only  
Foxtro." :END
130 IF A$ <> "1" THEN GOTO 100
140 A = VAL(A$)
150 PRINT "You chose "A$:END
```

Final Entry

Don't let a user make any choice your program isn't ready to handle. Limit the choice at the point of input, before the problem gets out of hand.

Coming next month, error recovery for disallowed prompt answers. ■

You can reach Richard Ramella at
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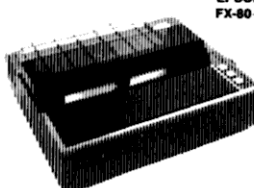
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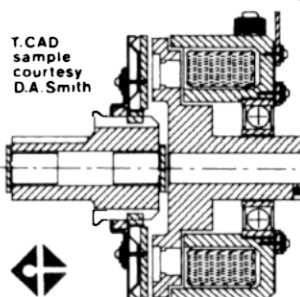
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Opening Windows On Your Model 4

The trouble with the Model 4 is that it can't do windows, I've heard.

Of course it can. Just because no one (to my knowledge) has written a general windowing program for the Model 4 doesn't mean it can't be done. During the next few months, I'll show you how to write a program that gives complex windowing capabilities to your Model 4 with TRSDOS 6.2.

For this project, I define a window as a video display that uses only part of the screen and leaves the rest unaffected. When you're done with a window, you should be able to close it and return to the previous display with everything intact.

My definition does not imply that one program can run in memory on top of another, but merely that you can impose one display on top of another. However, by the end of this project, you'll be able to run any DOS command from within a window, on top of almost any program.

The complete window program is much too long for a single column. This month, I'll explain the crucial video driver portion of the program. I'll add the interfaces during the next two months.

The Video Driver

You can write the video driver for a windowing program several ways. I considered writing a filter for TRSDOS's *DO driver that would catch each byte as it went to the video screen and decide how to handle it. That approach would work for text, but it would handle control characters and scrolling very slowly.

Therefore, I changed the resident video driver directly. This system has several advantages: you can use most of the resident video driver with few or no changes, you can access video RAM directly, and you shouldn't lose system speed.



System Requirements

Model 4
TRSDOS 6.2
Basic
Assembly language
Editor/assembler



Program Listing 1. Model 4 window driver.

```
00110 ; MODEL 4 WINDOW DRIVER
00120 ; Hardin Brothers -- The Next Step
00130 ; February 2, 1985
00140 ; -----
00150 ; This program patches the DOS *DO driver to support windowing
00160 ; on the Model 4/4p under TRSDOS 6.2 only!
00170 ;
00180 ; It modifies the *DO driver, and also uses 130 bytes of
00190 ; the low memory driver area (0FF4h to 12FFh).
00200 ; *****
00210 ;
00220 ; Equates to call *DO driver addresses
00230 ;
00240 CRSBOL EQU 0BF8H ;Cursor to beginning of line
00250 CRSUP EQU 0C2BH ;Cursor up one screen line
00260 DO_SCROLL EQU 0CCEH ;Beginning of scroll routine
00270 CLREOL EQU 0D12H ;Clear to end of line
00280 PUT_C EQU 0DCAH ;Put char. in C at cursor pos'n
00290 RC_2_ADDR EQU 0DD0H ;Change Row/Column in HL to
00300 ; video memory address
00310 ;
00320 ; Equates to patches in *DO driver
00330 ;
00340 CRSBOL2 EQU 0D16H ;Extension to CRSBOL
00350 PT_DE_TOP EQU 0C37H ;Point DE to top of window
00360 CHK_LN_END EQU 0CD1H ;Past end of window line?
00370 GET_END EQU 0CD8H ;Point HL ==> end of window line
00380 CLREOL1 EQU 0CE2H ;Extension to CLREOL
00390 ;
00400 ; SVCs used:
00410 ;
00420 @DSPLY EQU 10
00430 @EXIT EQU 22
00440 @HEX16 EQU 99
00450 ;
00460 ; If you use PRO-CREATE or EDAS, add the following macro definition:
00470 ;
00480 ; SVC MACRO #NUM
00490 ; LD A,#NUM
00500 ; RST 28H
00510 ; ENDM
00520 ;
00530 ; -----
00540 ; This is the new code that will be stored in low memory.
00550 ; -----
00560 ;
00570 PSECT 3000H ;Use ORG 3000H with EDAS
00580 JR CRSBK ;Create standard header
```

Listing 1 continued

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THE NEXT STEP

Listing 1 continued

```

00590 OLDHIGH      DW      $-5      ;Linkage byte
00600              DB      2          ;Name length
00610              DEFM     'WD'      ;Define module name
00620              DW      $-5,0      ;Maintain standard form
00630 ;
00640 ;Storage space for video parameters:
00650 LEFT_COL      DB      0          ;Left edge of window
00660 SCR_TOP       DW      0F800H    ;Beginning of screen window
00670 SCR_END      DW      0FF7FH    ;End of screen window
00680 SCR_LINE     DW      0079D     ;Length of window line -1
00690 ;
00700 CRSBK        RET      Z          ;Ignore if at beginning of window
00710              DEC      DE          ;Move back a space
00720              PUSH     DE          ;Save this address
00730              CALL     CRSBOL     ;Find beginning of line
00740              EX      DE,HL        ;Address to HL
00750              DEC      HL          ;Adjust to compare
00760              POP      DE          ;Retrieve cursor address
00770              OR      A           ;Reset C-Flag
00780              SBC      HL,DE       ;Moved past left edge?
00790              RET      NZ         ;No -- Return
00800              CALL     CRSUP       ;Move up one line
00810              CALL     GET_END     ;End of window line in HL
00820              EX      DE,HL        ;New cursor addr. to DE
00830              INC      A           ;Return with Z-Flag reset
00840              RET
00850 ;
00860 MOVCRS        PUSH     HL          ;Save registers
00870              PUSH     DE
00880              CALL     PT_DE_TOP    ;DE = Top of window
00890              SBC      HL,DE        ;Below top?
00900              POP      DE          ;Retrieve present cursor addr.
00910              JR      NC,MOVCRS1   ;Go if new addr. on screen
00920              POP      HL          ;Clear stack & discard
00930              RET
00940 MOVCRS1       POP      DE          ;New addr. in DE
00950              LD      HL,(SCR_END) ;P/u end of window
00960              EQU      $-2
00970              SBC      HL,DE        ;Past end?
00980              RET      NC          ;No -- return
00990              JP      DO_SCROLL-1   ;Lead into scroll routine
01000 ;
01010 AT_END        CALL     CHK_LN_END ;At end of line?
01020              JR      Z,CRSFRWD2   ;Yes -- Go to next line
01030              LD      A,(0076H)    ;P/u MODOUTS
01040              JP      0CBEH        ;Continue with normal CRSFRWD
01050 ;
01060 CRSFRWD1       JP      C,DO_SCROLL-1 ;Lead to scroll if end-of-frame

```

Listing 1 continued

I developed the window program as a series of patches to the DOS video driver. Where possible, I made those patches to the resident driver. However, the whole program won't fit there, so I stored the remainder (about 120 bytes) in TRSDOS's low-memory driver area, between OFF4 hexadecimal (hex) and 12FF hex. A series of calls and jumps connects the two parts of the program.

This program works only with TRSDOS 6.2, which I chose for two reasons. First, 6.2 is the most powerful version of Model 4 TRSDOS; even though the upgrade costs money, it's worth the price. Second, the source code for 6.2 is available from Logical Systems Inc. Without the original code and comments, patching the resident video driver would have been nearly impossible.

I wrote the program with Radio Shack's ALDS editor/assembler; if you use EDAS or Pro-Create, you need to make the changes I've explained in the listing. If you use another assembler, you may have to change the form of the macro instruction and some of the pseudo-ops.

How the Program Works

Program Listing 1 provides the window driver and the code necessary to install it. Lines 570-2480 are the actual driver; the

Circle 152 on Reader Service card.

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remainder of the program installs the changes (if possible) and reports its success or failure. Much of the program will be unclear unless you have a copy of the TRSDOS source code with which to compare the listing, so you'll have to accept my word that it works.

The Model 4's memory organization is fairly complex. When a program calls the keyboard or video driver, TRSDOS switches a special bank of RAM into place from 0F400-0FFFF hex. TRSDOS uses the area from 0F400-0F7FF hex for the keyboard and operates similar to the Model 1/III keyboard memory. The keyboard memory doesn't concern this program.

With the special bank in place, 0F800-0FF7F hex holds the video display. The system takes care of the switching, and it calls in the video RAM whenever TRSDOS activates the video driver. The system uses the final portion of this special memory bank, from 0FF80-0FFFF hex, for the type-ahead buffer and other storage.

TRSDOS's standard video driver assumes that the video RAM is a continuous 1,920 bytes of memory. To make the driver support windows, alter it so that it assumes that each video line is in contiguous memory and that the top and bottom of usable video memory resides at any address within the normal screen.

Therefore, I've made the first part of the window driver a storage area that holds four crucial pieces of information (lines 650-680): the column number of the left edge of the current window (between zero and 79), the beginning and ending absolute addresses of the current window, and the length of each display line in the window. The driver need only hold the addresses of the top left corner and bottom right corner of the window. But by storing the left-hand column of the window and the length of each line, the program avoids having to continually recalculate those values. The extra storage bytes use less memory than that required to do the calculations.

The remainder of the program comprises the patches necessary to make the video driver handle the screen or window on a line-by-line basis. I had to modify the routines that move the cursor back a space (CRSBKSP and CRSBK), forward a space (CRSFWRD), up or down a line (MOVCRS), clear to the end of a line (CLREOL), clear to the end of the screen (CLREOF), scroll the screen, and process a line feed character.

Part of the program resides in the low memory driver area, and part is patched over the original video driver. The installation section of the program (beginning at line 2580) checks to make sure that sufficient low memory exists. If so, it changes all absolute addresses in the program that

Listing 1 continued

```

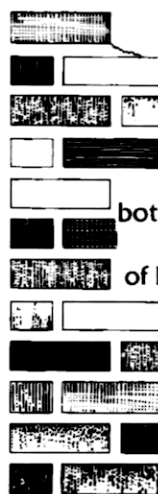
01070      CALL    CHK_LN_END      ;End of line?
01080      RET     NC              ;No -- return
01090 CRSFRWD2 LD     HL,80D      ;Screen line size
01100      ADD     HL,DE           ;Add to cursor pos'n
01110      EX      DE,HL          ;Position in DE
01120      CALL   CRSBOL          ;Move to beginning of line
01130      JP      @CC4H          ;Test for end of frame
01140      ;
01150 SCROLL  LD     DE,(SCR_TOP) ;Point DE to beginning of screen
01160      EQU     $-2
01170 SCR1   LD     HL,80        ;Screen line length
01180      ADD     HL,DE           ;HL= DE + one line
01190      PUSH    HL             ;Save for later
01200      LD      BC,(SCR_END)   ;Get end of window
01210 REL3   EQU     $-2
01220      DEC     BC             ;Adjust for check
01230      OR      A              ;Clear C-Flag
01240      SBC     HL,BC          ;Past end of window?
01250      JR      NC,SCR_OUT     ;Yes -- done
01260      POP     HL             ;Recover value
01270      PUSH    HL             ;Save again
01280      LD      BC,(SCR_LINE) ;Get line length
01290 REL4   EQU     $-2
01300      INC     BC             ;Make true length
01310      LDIR                      ;Move line up
01320      POP     DE             ;Beginning of next line
01330      JR      SCR1           ;Do it again
01340 SCR_OUT POP     HL          ;Clear off the stack
01350      POP     HL
01360      CALL   CRSBOL          ;Move to beginning of line
01370      JP      CLREOL         ;Erase to end of line
01380      ;
01390 DVR_LEN EQU     $-DVR_START ;End of low-memory usage
01400      ;
01410      ;
01420      ; Patches to the *DO Driver -- Since it doesn't move, no relocation
01430      ; is needed.
01440      ;
01450      ; Each patch has the beginning address, # of bytes to patch, and
01460      ; then the bytes to patch in.
01470      ;-----
01480      ;
01490 PATCH1  DW      @BFCH        ;Patch CRSBOL
01500      DB      3
01510      JP      CRSBOL2         ;To extension
01520      ;
01530 PATCH2  DW      @C05H        ;Patch CRSHOME
01540      DB      3
01550      CALL   PT_DE_TOP

```

Listing 1 continued

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Listing 1 continued

```

01560 ;
01570 PATCH3      DW      @C23H      ;Patch CRSBKSP
01580             DB          8
01590             LD      HL,(SCR_TOP) ;P/u top of screen
01600 REL5         EQU      $-2
01610             SBC      HL,DE       ;Still on screen?
01620             JP      CRSBK       ;Jump to extension
01630 REL6         EQU      $-2
01640 ;
01650 PATCH4      DW      @C34H      ;Patch MOVCRS
01660             DB          8
01670             JP      MOVCRS       ;Go to extension
01680 REL7         EQU      $-2
01690 ;
01700             LD      DE,(SCR_TOP) ;PT_DE_TOP Routine
01710 REL8         EQU      $-2
01720             RET
01730 ;
01740 PATCH5      DW      @CBBH      ;Patch CRSFRWD
01750             DB          3
01760             JP      AT_END       ;Jump to extension
01770 REL9         EQU      $-2
01780 ;
01790 PATCH6      DW      @CC4H      ;Patch CRSFRWB
01800             DB          8
01810             LD      HL,(SCR_END) ;P/u end of screen
01820 REL10        EQU      $-2
01830             SBC      HL,DE       ;Off screen?
01840             JP      CRSFRWD1     ;Jump to extension
01850 REL11        EQU      $-2
01860 ;
01870 PATCH7      DW      @CCEH      ;Patch DO_SCROLL
01880             DB          37
01890             JP      SCHOLL        ;Use new scroll
01900 REL12        EQU      $-2
01910 ;
01920             CALL     GET_END      ;CHK_LN_END Routine
01930             OR      A             ;Clear C-Flag
01940             SBC      HL,DE       ;Over the end?
01950             RET
01960 ;
01970             PUSH     DE           ;GET_END routine
01980             CALL     CRSBOL        ;Move to beginning of line
01990             LD      HL,(SCR_LINE) ;P/u line length - 1
02000 REL13        EQU      $-2
02010             ADD      HL,DE        ;End-of-line addr. in HL
02020             POP      DE
02030             RET
02040 ;
02050             CALL     GET_END      ;CLREOL1 Routine

```

Listing 1 continued

refer to the low-memory modules and then transfers those modules to the low-memory driver area.

Next, the program makes the necessary patches to the resident video driver by transferring each patch section separately to the necessary locations. Finally, it reports that it has made the changes and indicates the address where the table of video parameters resides. Write down that address to use with the test program (see Program Listing 2).

After you assemble and run Listing 1, you should see no immediate change in the screen display. To define a screen window, you must change the values in the video parameter table and then move the cursor inside the new window. The demonstration program in Listing 2 lets you test the window driver.

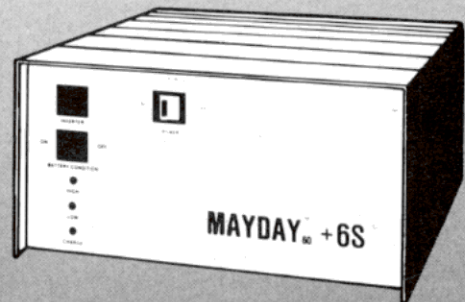
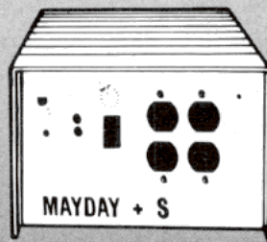
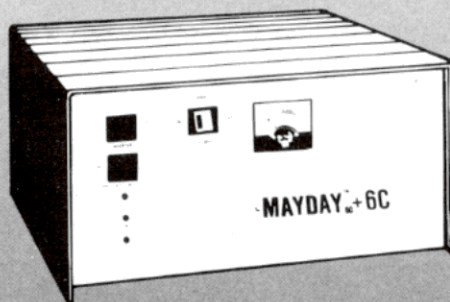
Listing 2 prompts you for the coordinates of the upper left and lower right corners of the window you want to define, sets the video parameters correctly, and then turns on inverse video for the window you have selected. Before running Listing 2, reset the value in line 70 to the address displayed when you installed the window driver.

After you define a window, you can return to TRSDOS and all programs that use the normal DOS display routines will be restricted to the window you've defined. However, programs that transfer

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THE NEXT STEP

buffers or lines directly to the screen with the @VDCTL supervisor call (SVC) will ignore your window. For example, Debug will stay inside the window but the LSFEDII/CMD file editor program will not.

With the window driver resident, the TRSDOS scroll-protect function won't work. I disabled that function to avoid the hangup that would occur if more lines were protected from scrolling than were available in the window.

The only program I've found so far that is incompatible with the video driver (others probably exist) is LeScript, which apparently uses part of the video driver plus its own code to handle screen displays. Other programs may do likewise. The window driver remains active until you reboot the system, so if you want to run a program that objects to the windows, you'll have to reset the computer.

The window driver is complete in Listing 1, but you need both user and program interfaces to make full use of it. I'll show you how to write and install those next month. ■

Contact Hardin Brothers through CompuServe (leave your messages on section zero of the WESIG message board), or write to him at 280 N. Campus Ave., Upland, CA 91786.

Listing 1 continued

```

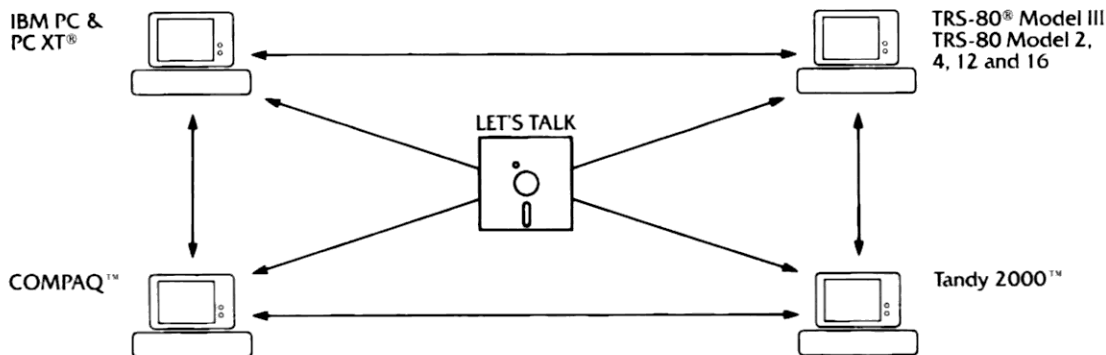
02060 LD C, ' ' ;Get a space to clear with
02070 CALL PUT_@ ;Normalize & print it
02080 INC DE ;Point to next space
02090 PUSH HL ;Save End-of-line addr.
02100 SBC HL,DE ;Are we there yet?
02110 POP HL ;Recover E-O-L addr.
02120 JR NC,CLREOL2 ;Loop until done
02130 POP DE ;Recover cursor addr.
02140 RET
02150 ;
02160 PATCH8 DW 0D0AH ;Patch LINFEED
02170 DB 6
02180 LD HL,(SCR_END) ;P/u end of window
02190 EQU S-2
02200 SBC HL,DE ;Past it?
02210 DB 38H ;Change JR Z to JR C
02220 ;
02230 PATCH9 DW 0D13H ;Patch CLREOL Routine
02240 DB 10
02250 JP CLREOL1 ;Jump to extension
02260 ;
02270 LD A,(LEFT_COL) ;CRSBOL2 Routine
02280 EQU S-2
02290 LD L,A ;Move left column to L
02300 JP RC_2_ADDR ;Make into addr. and return
02310 ;
02320 PATCH10 DW 0D1FH ;Patch CLREOF Routine
02330 DB 23
02340 CLREOF1 PUSH DE ;Save cursor position
02350 CALL CLREOL ;Clear to end of this line
02360 LD HL,80D ;One screen line
02370 POP DE ;Recover cursor addr.
02380 ADD HL,DE ;Get addr. of next line
02390 EX DE,HL ; into DE
02400 LD HL,(SCR_END) ;End of window?
02410 EQU S-2
02420 OR A ;Clear C-Flag
02430 SBC HL,DE ;Test for end
02440 JR C,CLRF_OUT ;Yes -- leave
02450 CALL CRSBOL ;Cursor to beginning of line
02460 JR CLREOF1 ;Repeat until done
02470 CLRF_OUT NOP ;Cover up old bytes
02480 NOP
02490 ;
02500 ;*****
02510 ;
02520 ; Move everything into place, then return to TRSDOS
02530 ;
02540 ; Start by installing low-memory extensions if there's room
02550 ;

```

Listing 1 continued

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Listings 1 continued

START	LD	DE,(#266H)	;Get lst addr. in driver area
	PUSH	DE	;Save it for later
\$D2596	LD	H,DVR_LEN	;Length of window drivers
\$D2598	LD	BC,#130BH	;End of low-driver area
\$D259A	ADD	H,DE	;HL ==> last used addr. in lownem
\$D259C	INC	H	;HL ==> Next avail. addr.
\$D259E	PUSH	HL	;Save it
\$D25A0	LD	(OLDHIGH),HL	;Put into header
\$D25A2	OR	A	;Reset C-flag
\$D25A4	SBC	HL,BC	;Will it fit?
\$D25A6	POP	HL	
\$D25A8	JR	C,OK	;Yes -- Go load it all
Not enough room			
\$D2760			
\$D2710			
\$D2720	POP	DE	;Clear the stack
\$D2730	LD	HL,NOMEM	;Point to msg
\$D2740	SVC	\$DSPLY	;Display it
\$D2750	SVC	\$EXIT	;And leave
\$D2760			
\$D2770			
\$D2780	LD	(#266H),HL	;Save new lownem pointer
\$D2790	LD	H,DVR_START	;Get start pointer
\$D2798	PUSH	HL	;Save it
\$D2800	EX	D,H	;Exchange registers
\$D2810	OR	A	;Clear C-flag
\$D2820	SBC	HL,DE	;Get offset
\$D2830			
\$D2840			
Relocate internal references			
\$D2850			
\$D2860			
\$D2870	LD	IX,REL_TBL	;Point to relocation table
\$D2880	LD	B,H	;Move offset to
\$D2890	LD	C,L	;BC Register
\$D2898	RLOP	L,(IX)	;Get address to change
\$D2910	LD	H,(IX+1)	;in HL
\$D2920	LD	A,H	;Get MSB
\$D2930	OR	A	;Is it #?
\$D2940	JR	Z,MOVE	;Yes - move everything
\$D2950	LD	Z,(HL)	;P/u contents to change
\$D2960	INC	HL	; in DE Register
\$D2970	LD	D,(HL)	
\$D2980	EX	DE,HL	;Move to HL
\$D2990	ADD	HL,BC	;Add offset
\$D3000	EX	DE,HL	;Move new addr. back to DE
\$D3010	LD	H,(HL),D	;Put it back
\$D3020	DEC	HL	
\$D3030	LD	(HL),E	
\$D3040	INC	IX	;Bump twice to point to
\$D3050	INC	IX	; next address
\$D3060	JR	RLOP	;Do it again
\$D3070			
\$D3080	POP	HL	;Recover beginning of driver
\$D3090	POP	DE	;Recover destination
\$D3100	PUSH	DE	;And save again
\$D3110	LD	BC,DVR_LEN	;Bytes to move
\$D3120	LDIR		;Move it all
\$D3130			
Load in patches			
\$D3140			
\$D3150			
\$D3160			
\$D3170	LD	IX,PATCH_TBL	;Point to table
\$D3180	LD	L,(IX)	;Get LSB of patch addr.
\$D3190	LD	H,(IX+1)	; and MSB
\$D3200	INC	IX	;Point to next patch
\$D3210	INC	IX	
\$D3220	INC	A,H	;Get MSB for testing
\$D3230	OR	A	;Is it #?
\$D3240	JR	Z,DONE	;Yes -- Go
\$D3250	LD	E,(HL)	;P/u LSB of Patch area
\$D3260	INC	HL	
\$D3270	LD	D,(HL)	; and MSB
\$D3280	INC	HL	
\$D3290	LD	B,(HL)	;P/u patch length
\$D3300	INC	HL	;HL==> last byte of patch
\$D3310			
\$D3320			
\$D3330			
\$D3340			
\$D3350			
\$D3360			
\$D3370			
\$D3380			
\$D3390			
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\$D3800			
\$D3810			
\$D3820</			

Listing 1 continued

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Formatting Multiplan Files: Smoother Than SYLK

by David A. Williams

As with any program, spreadsheets should offer you some way to document the data in your file. Most spreadsheets provide a way to do this, but they generally only document column and row labels. Multiplan is no exception.

You would probably find it more useful to have a record of spreadsheet cell names, cell formats, cell formulas, and column widths. I've written a program that provides this information for Multiplan files.

Multiplan's symbolic link file format (SYLK) offers a complete worksheet record, and it's great for linking Multiplan with applications programs. However, deciphering its printouts is difficult (see Fig. 1). My program, Documenter, takes SYLK files and prints them out in an easy-to-read, permanent format (see Fig. 2).

Documenter runs on the Model 4 with Multiplan 1.06 and on the Models 1000 and 1200 with Multiplan 1.2.

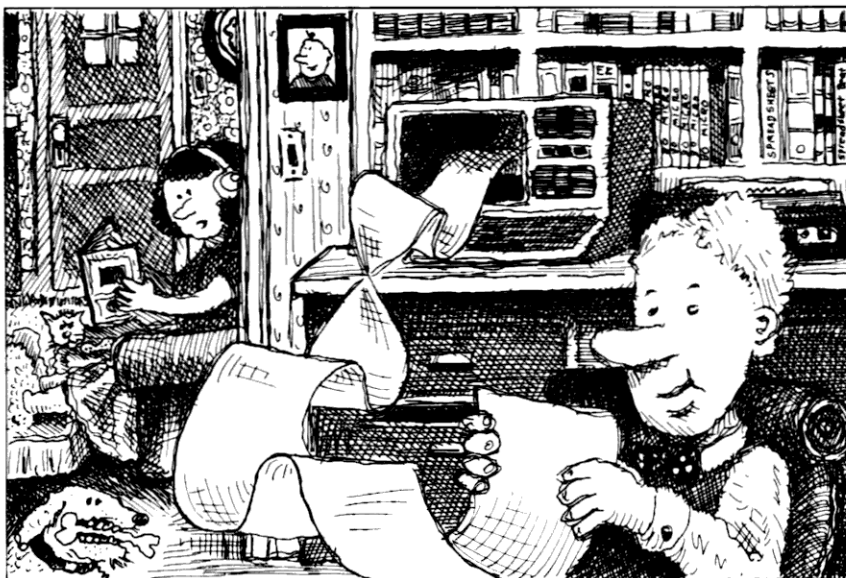
Figure 1 represents Multiplan's SYLK file format; Fig. 2 is its Documenter version. I've suppressed the Multiplan labels and separated the other information into four categories: cell names, cell formats, cell formulas, and column widths. You can print any combination of these by making the appropriate selection from Documenter's printout menu (see Fig. 3).

To use my program, enter Basic and load Documenter. Documenter prompts you for the name of a Multiplan file, which must be in the SYLK format. It loads the file, processes it, displays the printout menu, and waits for you to choose options.

How Documenter Works

The Multiplan manual explains the SYLK format in detail. Multiplan uses codes to identify the different kinds of information in the file. Documenter uses these codes to separate data into the four categories mentioned above.

As Documenter reads a file, it processes and stores data in the array MP\$. Think of this array as a table of five columns. The first column is the row and column location associated with the data in the other four columns. If the data is global, column one is blank. The second column contains cell names, the third holds formats, the



Program Listing. Documenter.

```

10 'Program to strip Multiplan data from SYLK format files
20 CLS : CLEAR : DIM MP$(600,5)
30 LINE INPUT "Input Filename of Multiplan File..."; FILENMES
40 OPEN "I", 1, FILENMES
50 LINE INPUT# 1, WDS
60 IF WDS = "E" THEN CLOSE : GOTO 490 'Print Routine
70 TYPES = LEFT$(WDS, INSTR(WDS, ";")-1)
80 IF TYPES = "C" THEN GOTO 380 ELSE Z=0 'Formula Routine
90 IF TYPES = "NN" THEN GOTO 140 'Name Routine
100 IF TYPES = "F" THEN GOTO 210 'Format Routine
110 GOTO 50
120 '
130 'Name Routine
140 DS = RIGHT$(WDS, LEN(WDS)-4) 'Strip first four characters
150 MP$(COUNT, 2) = LEFT$(DS, INSTR(DS, ";")-1) 'Save name
160 MP$(COUNT, 1) = RIGHT$(DS, LEN(DS)-INSTR(DS, ";")-1) 'Location
170 COUNT = COUNT + 1
180 GOTO 50
190 '
200 'Format Routine
210 IF MID$(WDS, 3, 1) = "X" OR MID$(WDS, 3, 1) = "Y" THEN GOSUB 300
220 MP$(COUNT, 1) = ROWS + COLS 'Save location
230 IF MID$(WDS, 3, 1) <> "W" THEN GOTO 250
240 MP$(COUNT, 5) = RIGHT$(WDS, LEN(WDS)-2) : GOTO 260 'Save width
250 MP$(COUNT, 3) = RIGHT$(WDS, LEN(WDS)-INSTR(2, WDS, "P")) 'Format
260 COUNT = COUNT + 1
270 GOTO 50
280 '
290 'Row/Col Routine
300 IF MID$(WDS, 3, 1) = "X" THEN 320
310 ROWS = "R" + MID$(WDS, 4, INSTR(4, WDS, ";")-4) 'Update row number
320 X = INSTR(WDS, "X") : IF X = 0 OR X > 8 THEN RETURN
330 SC = INSTR(X, WDS, ";")
340 COLS = "C" + MID$(WDS, X+1, SC-X-1) 'Update column number
350 RETURN
360 '
370 'Formula Routine
380 GOSUB 300 'Update row, column numbers
390 K = INSTR(WDS, ";K") : S = INSTR(WDS, ";S")
400 IF S>0 AND K>0 AND Z=1 THEN MP$(COUNT, 4) = " " + CHR$(34) : GOTO 440
410 FS = INSTR(WDS, "E") + 1 : FL = INSTR(FS, WDS, ";") - FS
420 IF INSTR(WDS, ";E") = 0 THEN Z=0 : GOTO 50
430 MP$(COUNT, 4) = MID$(WDS, FS, FL) 'Save Formula
440 MP$(COUNT, 1) = ROWS + COLS 'Save location
450 COUNT = COUNT + 1 : Z=1
460 GOTO 50
470 '
480 'Print Routine

```

Listing continued

```

ID;PMP
F;D$G10
F;W1 1 20
F;W2 4 12
F;W6 6 12
F;FG0D;C7
F;FG0D;C8
F;FG0D;C4
F;FD0C;R2
F;FD0C;R3
B;Y8;X8
NN;Ninitval;ER4:6C2
NN;NRate;ER4:6C4
NN;NPresval;ER4:6C6
NN;Ndays;ER4:15C7:8
NN;Ndate;ER1C3
NN;Ninitdate;ER4:6C3
NN;Ntotval;ER8C5
C;Y2;X1;K"Initiation"
C;X2;K"Initial"
C;X3;K"Interest"
C;X4;K"Rate"
C;X5;K"Maturity"
C;X6;K"Present"
C;X7;K"Month"
C;X8;K"Days"
C;Y3;X2;K"Value"
C;X3;K"Date"
C;X4;K"Rate"
C;X5;K"Date"
C;X6;K"Value"
C;Y4;EIF(Initval>0,Initval*
((1+(Rate*0.01/365))
^(Initval+Presval)), "");D;K""
C;Y5;S;R4;C6;K""
C;Y6;S;K""
C;Y4;X7;K1
C;X8;K0
F;Y5;X1;F10C
C;X7;K2
C;X8;K31
C;Y6;X7;K3
C;X8;K59
C;Y7;X2;ESUM(Initval);K0
C;X4;ESUM(R[-3]C;R[-1]C);K0
C;X5;ER[-2]C-R[-1]C;K0
C;X6;ESUM(Presval);K0
C;X7;K4
C;X8;K90
C;Y8;X5;ER[-1]C[-1]*R[-1]C;K0
C;X7;K5
C;X8;K120
W;N1;A1 1
E

```

Figure 1. Printout of a Multiplan symbolic link (SYLK) file format.

```

Multiplan File sample/s1
(a) Names
R4:6C2      Initval
R4:6C4      Rate
R4:6C6      Presval
R4:15C7:8    Days
R1C3        date
R4:6C3      Initdate
R8C5        totval

(b) Formats
F;D$G10
G0D;C7
G0D;C8
G0D;R2
G0C;R2
D0C;R3
I0C

R5C1

(c) Formulas
R4C6      IF(Initval>0,
((1+Rate*0.01/
Initval*
365))^(Initval
+Presval)), "")

R5C6      "
R6C6      "
R7C2      SUM(Initval)
R7C4      SUM(R[-3]C;R[-1]C)
R7C5      R[-2]C-R[-1]C
R7C6      SUM(Presval)
R8C5      R[-1]C[-1]*R[-1]C

(d) Column Widths
W1 1 20
W2 4 12
W6 6 12

```

Figure 2. Documenter version of the file shown in Fig. 1.

```

Print Multiplan Names (1)
Formats (2)
Formulas (3)
Widths (4)
Quit (5)

Pick One

```

Figure 3. Documenter's menu.

fourth lists formulas, and the fifth defines column widths.

Four subroutines separate the desired data and keep track of the row-column location. The rest of the program formats the printed output.

Documenter Output

Multiplan stores cell names (Fig. 2a) in the order in which you originally entered them and Documenter lists them in this order.

The first cell format listed (Fig. 2b), represents the default cell format. In this case, the format code is "\$," the number-of-digits argument is "0," the alignment code is "G" or general, and the default column width is 10. The next five formats apply to entire columns or rows as indicated and the final one applies only to cell R5C1.

Documenter generally lists formulas (Fig. 2c) in order by rows, but there may be exceptions. In any case the location is always listed. Documenter indents the overflow from long formulas. When you use the Copy Down or Copy Right command to duplicate formulas, Multiplan does not repeat the formulas, but only stores a reference to the original cell. Documenter detects this and prints ditto marks in these locations.

In the column widths section (Fig. 2d), column 1 is 20 characters wide, and columns 2-4 and column 6 are 12 wide. Column widths that equal the default width are not listed. ■

Write to David A. Williams at 2452 Chase Circle, Clearwater, FL 33546.

Submit your template to Spreadsheet Beat, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458. We'll pay \$50 for each one we publish. We'll also publish any valuable hints and patches you'd like to share.

Circle 207 on Reader Service card.

Listing continued

```

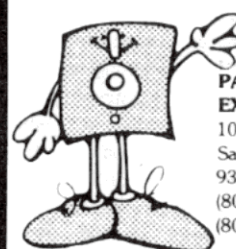
490  LINES=3 : FLAG=0
500  CLS
510  PRINT : PRINT : PRINT "Print Multiplan Names (1)"
520  PRINT "      Formats (2)"
530  PRINT "      Formulas (3)"
540  PRINT "      Widths (4)"
550  PRINT "      Quit (5)"
560  PRINT : PRINT "      Pick One "
570  IS = INKEY$ : IF IS = "" THEN GOTO 570 ELSE PICK = VAL(IS)+1
580  CLS
590  IF PICK=6 THEN END
600  IF FLAG=1 THEN 650 'Don't repeat message
610  PRINT : PRINT "Adjust paper to top of form, <ENTER>"
620  IS=INKEY$ : IF IS = "" THEN GOTO 620
630  LPRINT "Multiplan File ";FILENAME$ : LPRINT : LPRINT
640  FLAG = 1
650  ON PICK - 1 GOTO 660, 670, 680, 690
660  LPRINT "Names" : GOTO 700
670  LPRINT "Formats" : GOTO 700
680  LPRINT "Formulas" : GOTO 700
690  LPRINT "Column Widths"
700  LPRINT : LINES=LINES+2
710  FOR N = 0 TO COUNT - 1
720  IF MP$(N,PICK) = "" THEN 820
730  LPRINT MP$(N,1), "Print location"
740  IF LEN(MP$(N,PICK))>63 THEN 760
750  LPRINT MP$(N,PICK) : LINES = LINES + 1 : GOTO 810
760  LPRINT LEFT$(MP$(N,PICK),60)
770  IF LEN(MP$(N,PICK))>123 THEN 790
780  LPRINT "      ", MID$(MP$(N,PICK),61,63) : LINES=LINES+2 : GOTO 810
790  LPRINT "      ", MID$(MP$(N,PICK),61,60)
800  LPRINT "      ", MID$(MP$(N,PICK),121,63) : LINES = LINES + 3
810  IF LINES > 53 THEN LPRINT STRING$(65-LINES,13) : LINES = 0
820  NEXT
830  IF LINES<48 THEN LPRINT STRING$(2,13) : LINES=LINES+3 : GOTO 850
840  LPRINT STRING$(65-LINES,13) : LINES=0 'Advance page
850  GOTO 500

```

End

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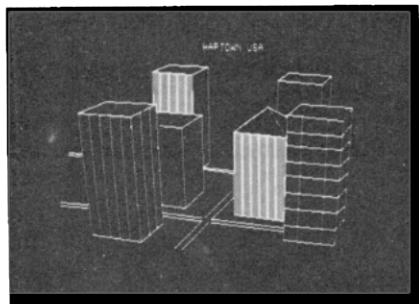
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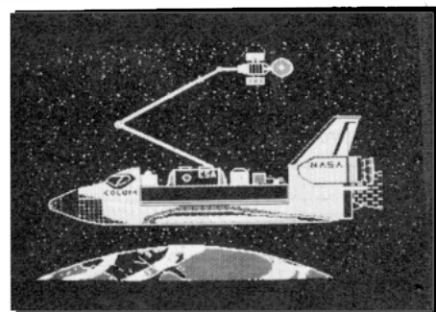
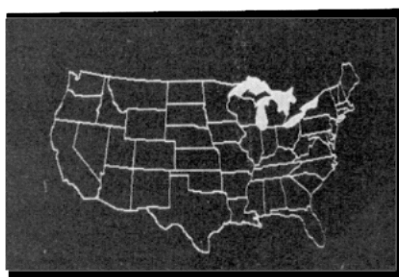
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The Grafyx Solution package is shipped complete for \$199.95 (reduced from \$299.95). A manual for review is \$15. Payment may be by check, Visa/MC, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5% tax.

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Continued from p. 34

Stay in Touch With Remote Control by Thomas L. Guindry

★★★★★

Remote Control runs on the Models 1000 and 1200 (128K) under MS-DOS 2.X. It requires one disk drive. Kensington Microware Ltd., 251 Park Ave. S., New York, NY 10010. 212-457-5200. \$180.

Easy to use: ★★★★★
Good docs: ★★★★★
Bug free: ★★★★★
Does the job: ★★★★★

Portable computers are great for on-the-go beeping, but their virtue has also been their limitation: Because they're portable, they lack some of your desktop's features. Kensington Microware's Remote Control provides a solution: It lets you access a Model 1000/1200 with a Model 100 from a remote site and use the MS-DOS machines' heavy-duty capabilities, like disk storage and printer and DOS functions. Back home, you can establish a direct link between the 100 and 1000 for high-speed file transfer.

In addition, you can use Remote Control on your 1000 to get Model 100-like telecommunications and text editing capabilities.

I found Remote Control a useful extension to the Model 100 for both the novice and expert. And its functional similarity to the Model 100's text editing and telecommunications programs means you don't have to learn many new commands.

Functions

Remote Control provides four programs: a host feature, where the 1000 acts as host to a remote Model 100 so you can upload and download text files, print hard copy at the host site, and execute DOS commands; a fast file transfer system to move files between your 100 and 1000; telecommunications capability; and a Model 1000 text editing program like the one on the 100.

To use Remote Control, you insert the program disk in your MS-DOS computer and boot it up. You'll see a main menu with selections for the four modes listed above, plus options to configure the MS-DOS system, return to DOS, or call a help file.

You should first run the configuration program to set up telecommunications and text editing parameters on your Model 1000. You can set up different communications ports on the 1000 as the modem and the RS-232 port, and use

You can establish a link between the 100 and 1000 for high- speed file transfer.

autodialing parameters compatible with the Hayes Smartmodem. You can also define defaults, such as a Host log-on password.

The Host Mode

The Host mode requires an auto-answer modem (like the Hayes Smartmodem) with the capability to respond to a hang-up signal. Your Model 1000 must have Remote Control running when you make the phone connection, and you must enter a five-character password to get on-line. Several commands (including Help) are available remotely. The main purpose of the Host mode is for uploading and downloading files, but it also allows direct DOS access.

I was a little nervous about this. I don't mind limited access to one disk in a computer, but the Host program gives you (or any caller who successfully makes the connection) complete access to all files. An unauthorized user could easily wipe out the files of a complete hard drive. Still, there is a security measure. The Host program will hang up the phone after four unsuccessful password attempts.

File Transfer

You upload and download files at high speed through the RS-232 ports of both computers using the supplied null modem cable. Remote Control supports file transfers at up to 9,600 baud. Due to programming delays, however, I found the difference between 9,600- and 4,800-baud transfer negligible. In addition, spurious control characters entered my text when I used 9,600 baud.

The cable transfer program isn't as useful as the Host mode program, but it's faster. You have to control both the 100 and MS-DOS keyboards with the cable program, but you can operate the Host mode with only a Model 100.

Remote Control's null modem cable is only 3 feet long, hardly long enough to plug into my IBM PC and bring the Model 100 in front where I could see the IBM PC screen. A 5-foot cable would be more desirable.

I had a lot of trouble keeping the null cable plugged into the 100. Two clips that hold the connector hood on the cable don't provide enough clearance to fit in the cutout space on the 100.

I solved this by bolting the connector

hood together with two #4 nuts and machine screws. Also, the connector that plugs into the 100 only has pins for those wires that it uses (nine of the 25 pins). This hardly provides enough grip to keep the connector firmly attached. When the connector fell off, the PC would lock up with a parity check error.

Telecommunications

Remote Control's Telcom for the Model 1000 uses the same commands as the Model 100. It also includes parameters for 1,200-baud communications, a document filter toggle key (to eliminate unwanted end-of-line characters), a key to change the current default directory, and a key to configure the remote control programs without breaking from the terminal mode.

Text Editor

Remote Control's Model 1000 text editor is similar to that on the 100, but with added features to format text for printouts. In addition, the editor has a find-and-replace feature, a "whoops" function (to restore inadvertently deleted text), printer or screen format commands, and several text formatting commands.

Though Remote Control provides default values for the usual formatting requirements, you can enter your own commands to customize your final printout. You can control top, bottom, left, and right margins; centering and indentation; line spacing; titles; and page numbers. A command also tests a page and forces a form feed if fewer than a set number of lines remain; you can use this to force a form feed from anywhere on the page, too.

Documentation

The manual for Remote Control is quite extensive, with over 200 medium-sized pages. One-third of the manual is specific to the 100, and another third is specific to the NEC PC-8201A computer.

The manual is split into four sections. The first is a tutorial that provides some examples of the Remote Control program. Next is a user guide that discusses each part of the program and how to use it. A reference section gives specific details about features or commands. Appendixes cover support topics, a glossary, an index, and program installation.

Copy Protection

One drawback to Remote Control is that it's distributed on a protected disk. You can copy programs from the master disk but you have to have the master disk in drive A to run it. Remote Control reads an oddly formatted sector or track before the program will work. This is similar to other MS-DOS protection schemes, like the one on Lotus 1-2-3. ■

Electric Desk

★★★★

Electric Desk runs on the Tandy 1000/1200 (256K) and requires MS-DOS 2.X. Alpha Software Corp., 30 B Street, Burlington, MA 01803, 617-229-2924. \$295.

Model 1000 owners who like Desk-Mate's integration and want a boost in power should consider Electric Desk. The program includes a data base, word processor, telecommunications, and spreadsheet.

Electric Desk presents a main menu along the screen bottom and a row of applications-specific macros at the top. You have to open Electric Desk's modules before you can use them. Once you do so and load them into memory, the program makes no further disk input/output.

On the down side, the program operates entirely in RAM and gobbles memory. On a 256K Model 1000 (the minimum), I ran out of memory after loading three one-page documents. You would need at least 384K to fully use the program's integrated functions.

Given enough memory, you can open up to 30 modules (nine data bases, nine documents, nine spreadsheets, two communication services, and a Help file).

The Document module is a simple word processor that's best suited for short text. The program lacks an easy way to indent and it deletes in blocks only. The cut-and-paste feature saves marked text to a buffer, and lets you make multiple insertions. You can also use the buffer to transfer data among modules.

The data base module automatically saves changes when you exit it. It also indexes and saves records alphabetically by field for sequential searches. You can also make random searches using relational symbols.

The spreadsheet provides a 255- by 255-cell grid with cell references in row/column format. The program identifies cells automatically, depending on whether the first character entered is a mathematical operator, a letter, or a numeric value. You can create formulas with the Point function and special macro keys by pointing to cells or ranges of cells, rather than by typing in locations.

The Communications module uses log-in scripts created on the word processor. Macro keys set up communications, call

a log-in script, send and receive files, and disconnect the modem.

Electric Desk's function and cursor movement keys remain the same across applications, and you can get from one application to another without waiting for disk I/O. The package lacks the graphics capabilities of more sophisticated integrated software, but at \$295 it's half the price of Symphony.

—Robert Mitchell

Overdrive

★★★★

Overdrive runs on the Model 4/4P (128K) and requires TRSDOS 6.2. Logical Systems Inc., 8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454. \$99.

If you're looking for faster disk input/output (I/O) and have a 128K 4/4P running TRSDOS 6.2, Overdrive can help. Overdrive loads disk data and some of TRSDOS's system modules into your alternate 64K memory (also called buffered memory), eliminating disk I/O and speeding up program execution.

When you call for data off a disk, Overdrive reads the entire data track into alternate memory. From then on, your system accesses any data almost instantly. This greatly enhances access to sequential data files and system overlays.

Overdrive uses one bank of alternate memory for each drive you buffered, with a bank of memory defined as 32K in length. You can buffer only two out of the Model 4/4P's four possible drives because of Overdrive's 64K limit.

The buffered memory uses 16K for the drive buffer and another 16K for system overlays. It also uses approximately 400 bytes of resident memory for the disk driver.

You can install Overdrive on one or both drives or you can reserve the memory for later use. If you decide to use TRSDOS 6.X's Memdisk, you can only buffer one bank of memory.

Since your system stores random files on disk in scattered order, reading an entire track into buffered memory would be ineffective and might actually slow down the system. Therefore, you should disable Overdrive's buffer when you access random files.

You need to take some precautions with Overdrive. First, you should disable all buffered drives before you invoke the System command. Second, if you use the LS-DiskDisk driver, you can't buffer both the outer and inner drive at the same time or the system will hang up.

I found Overdrive easy to learn. While the documentation consists of only four pages, it's precise and clear in explaining its use.

However, I would like to have seen two other features with Overdrive: the ability to speed up the acquisition of random-access files, and the ability to use library commands like Directory to take advantage of the increase in speed.

—David L. Engelhardt

Etch-A-Mouse

★★★★

Etch-A-Mouse runs on the Tandy 2000 (128K), and requires the Tandy CM-1 color monitor, the high-resolution graphics option, the calendar/clock board, and the Digi-Mouse. Soft Horizons, RD 1 Box 432, State Highway 83, Cape May Court House, NJ 08210. \$49.

Etch-A-Mouse makes full use of the Tandy 2000's Digi-Mouse system to create color or video displays in almost no time. You would need to spend hours programming to create these displays using conventional graphics techniques.

You can draw with any of 16 colors, in the Select Colors option, and a setup program lets you set printer codes for the Tandy CGP-220 color printer.

The Draw program presents you with a blank screen in your choice of background color. The status line at the bottom displays the background color currently selected and the in-use color (the color with which you're drawing).

The cursor's response to the mouse's movements is excellent, without any noticeable lag. You can change the drawing with the buttons on the mouse.

You use the arrow keys to lock one of the coordinate values (X or Y) on the screen. The Line, Circle, Box, and Box Fill commands use that mark and the current cursor location to define shapes' boundaries. You can draw the shapes' lines in several different widths, with single-pixel lines standard.

The Paint command fills any delimited area with the currently selected color, limited to the same color as the lines bordering the design.

Designs require at least 96K of memory per picture, due to the way the 2000 stores video information.

Etch-A-Mouse's help section didn't work at all and hung up the program. Fortunately, I was able to repair it.

I was also bothered by the lack of file security; it was too easy to load a file over a current picture. The program should provide a safety prompt.

Otherwise, I found the graphics capability of Etch-A-Mouse impressive; it provides more for your dollar than other Model 2000 graphics software available.

—John B. Harrell III

Express Checkouts provides capsule reviews of interesting new products, new releases of old software, and products for computers we do not cover extensively in our regular review section.

EXPRESS CHECKOUTS

TRSDOS 6.X Training Course

★ ★ ★

The **TRSDOS 6.X Training Course** runs on the Models 4/4P (64K) and requires one disk drive. Tandy/Radio Shack. One Tandy Center, Fort Worth, TX 76102. \$74.95.

The TRSDOS 6.X Training Course consists of three informational text disks and a brief manual. To start, you put the first disk in drive zero and press the reset button. You choose topics on TRSDOS 6.X by responding to a series of menus and sub-menus. The course consists of a collection of short subjects, quizzes, and summaries. It encourages you to use the associated exercises presented in the manual.

The Training Course presents an extensive number of general study areas: how to use the training course, TRSDOS components and files, system and invisible files, file names and extensions, device specs, passwords, part specs, command parameters, creating and using simple job control language (JCL) files, and redirecting and filtering input and output. The course also covers many of the TRSDOS 6.X commands and utilities: Directory, Attribute, Auto, Format, Back-up, Copy, Purge, Remove, Rename, Free, Library, System, Memdisk, and Do.

While the above list seems impressive, the general level of detail is superficial. For example, in explaining the Back-up and Format commands, the Training Course covers the basics, but omits topics like using parameters to avoid program prompts, formatting and backing up nonsystem disks, and single drive back-ups by class.

I also thought the section on device drivers and filters lacked detail. While the Training Course handled their installation pretty well, it included no information on how you could automatically set them up with the SYSGEN command or a JCL file.

Additionally, the course explains the System command only as it applies to Memdisk. The System command is also useful in streamlining the TRSDOS operating system to the user's preference.

The Training Course's extensive use of the Model 4's limited graphics and sound capabilities greatly enhances the learning process. While the organization and interactive presentation is quite good, the bare bones attempt in covering the subject areas limits its usefulness. This course is more suited for new Model 4 owners who have limited experience.

—Mark D. Goodwin

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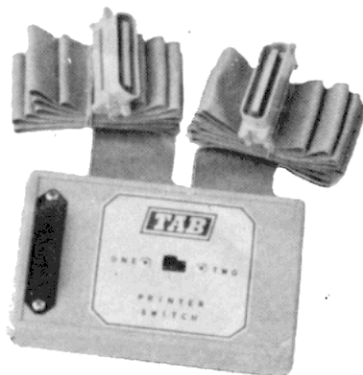


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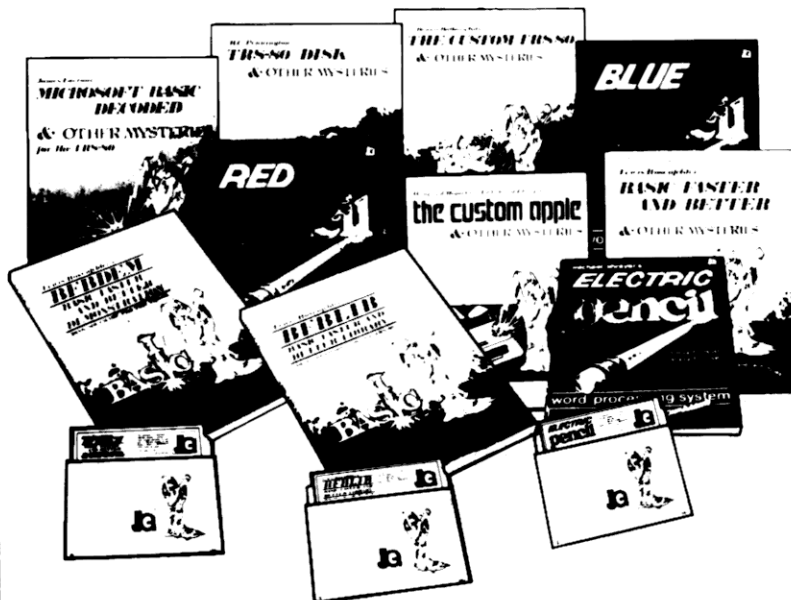
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25-2058	Model 3 VisiCalc	85
25-2059	Model 3 VisiCalc	85
25-2060	Model 3 VisiCalc	85
25-2061	Model 3 VisiCalc	85
25-2062	Model 3 VisiCalc	85
25-2063	Model 3 VisiCalc	85
25-2064	Model 3 VisiCalc	85
25-2065	Model 3 VisiCalc	85
25-2066	Model 3 VisiCalc	85
25-2067	Model 3 VisiCalc	85
25-2068	Model 3 VisiCalc	85
25-2069	Model 3 VisiCalc	85
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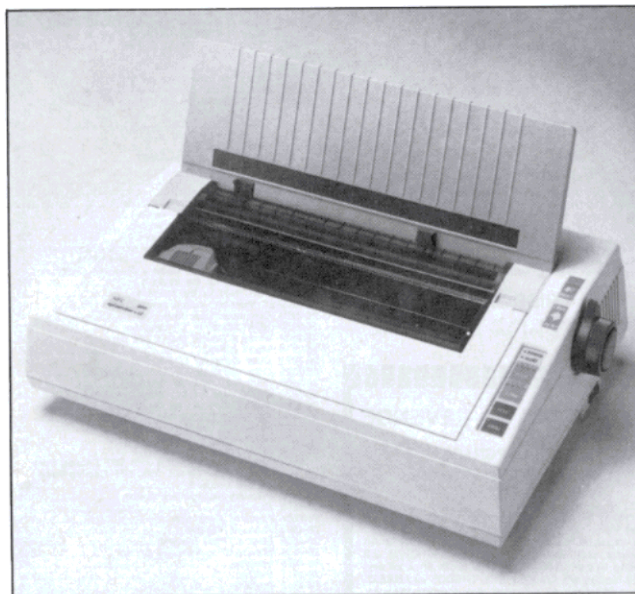
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Circle 551 on Reader Service card.

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The Spinwriter Elf 190 cps daisy-wheel printer.

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Circle 553 on Reader Service card.

Daisy-Wheel Press

The Spinwriter Elf bidirectional daisy-wheel printer (\$595) prints up to 190 words per minute and features bold face, shadow print, and 10, 12, or 15 characters per inch spacing pitch.

The Elf provides buttons for pitch, form feed, line feed, print control, and a single-lever paper control. It runs at 55 decibels. The Elf supports Lotus 1-2-3, WordStar, dBase, PFS:File, and Multimate. A unidirectional tractor feeder is optional.

For more information, contact NEC Information Systems Inc., 1414 Massachusetts Ave., Boxborough, MA 01719, 617-264-8000.

Circle 552 on Reader Service card.

Let Your Computer Do the Walking

Instant Yellow Page Service, from American Business Lists Inc. (5639 S. 86th Circle, P.O. Box 27347, Dept. N, Omaha, NE 68127, 402-331-7169), is a 24-hour on-line data base that lets you access 6 million business phone numbers and addresses from your computer.

The data base contains instant access to every Yellow Page directory in the U.S. A subscription is \$15 per month. Connect-time charges are \$1 per minute and 10 cents per printed record.

Circle 554 on Reader Service card.

Family Ties

Ultimate Roots (\$39) is a Model I/III/4 genealogy program that organizes and prints out genealogical charts.

A filer program lets you add, edit, delete, and revise information. You can then save the chart to disk, sort it, or print it out. The program gathers infor-

mation on family and children, and includes source and comment sheets. You can select from hundreds of print formats.

The manual is available separately for \$25, applicable toward purchase of the complete package. For more details, contact Ultimate Software, P.O. Box 1291, Hayden Lake, ID 83835, 208-772-7634.

Circle 558 on Reader Service card.

Bytes of Diplomacy

Computer Diplomacy for the Models III, 4, 1000, and 1200 is an adaptation of Avalon Hill's Diplomacy board game.

The game displays a map of Europe. Up to seven players try to conquer their opponents through war, alliances, and diplomacy. Included are a rule book, a pad of conference maps, and the program disk.

A Model III/4 version is available at Radio Shack stores for \$25. The MS-DOS version (\$50) requires 256K RAM and a color graphics board. For more information, contact The Avalon Hill Game Co., 4517 Harford Road, Baltimore, MD 21214, 800-638-9292.

Circle 559 on Reader Service card.

Cash In

The Regit Cash Register and Inventory Control System (\$179) turns the Model III or 4 into a point-of-sale cash register, complete with a locking cash drawer.

Regit's software generates sales and inventory reports on a daily, weekly, or monthly basis. Screen characters are double-size for easy viewing. Displayed information includes price, item description, tax, and sales total. The program computes change, updates sales and inventory records, opens the cash drawer,

MEGABYTES FOR MINI-BUCKS

Model 1, 3, 4 Hard Drives

	Primary	Secondary
5 Megabyte —	\$ 795.	\$ 595.
10 Megabyte —	\$1095.	\$ 895.
15 Megabyte —	\$1295.	\$1095.
30 Megabyte —	\$1895.	\$1695.

(Model 1 add \$50.)

TRS-80 Hard Disk Subsystem Features*

- * All sizes rated after formatting
- * TRS-80 Models 1,3,4, and 4P supported
- * Your choice of DOSPLUS, LDOS, or TRSDOS 6.x Software Drivers included.
- * Newdos 80/Version 2.5 Systems available.
- * Up to two secondary drives may be added.
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- * Buffered seek drives for improved access time.
- * Built in power up diagnostics.
- * Drives use plated media for long disk life.
- * Heavy duty power supply.
- * Fan cooled.
- * Gold connectors used throughout for high reliability.
- * 1 year warranty



Shop and compare. Hard Drive Specialist has been building hard drive systems for years and have sold thousands of subsystems to satisfied TRS-80 customers. We fully support TRS-80 Models 1,3,4, and 4P computers on available hard drive operating systems. We use the latest state-of-the-art drives and controllers. Our drives all use buffered seek logic and plated media to result in almost one-fourth the average access times found on our competitors drives. Plated media results in longer platter life and high resistance to head crashers not found on coated media drives. We utilize high construction throughout including heavy duty power supply, cooling fan and gold edge card connectors. We back our drives with a one year parts and labor warranty and we're so sure that you'll like our drive that we offer a thirty day money back guarantee. So when it comes time to buy, look beyond the price and choose the best drive. After all, we are the Hard Drive Specialist!

HDS Multiplexer

\$1295.

The HDS Multiplexer allows the usage of up to 4 Model III or IV systems using Dosplus 3.5, LDOS, TRSDOS 6.x, and DOSPLUS IV on a HDS Hard Drive. The standard package includes the Master Control Unit, Host Adapters for 2 Computers and 40' of cable. Each additional Host adapter add \$150. Each additional foot of cable add \$1. up to 100 feet per computer.

Model 3/4 Boot Rom \$39.95

Allows you to boot directly from a HDS Hard Drive using DOSPLUS. Versions available for useage with and without Multiplexer.

AS SEEN AT THE RADIO SHACK
COMPUTER SHOWCASES

Tandy 1000 Hardware

Tandy 1000

TanPak

The first and only board that your Tandy 1000 may ever need. Your 1000 is very versatile, new applications and functions are being developed for it every day. And now with the HDS TanPak you can keep your options open for tomorrows technology. As you know the Tandy 1000 only has 3 expansion slots, and those are not quite PC compatible. The TanPak does the job using one expansion slot that normally would require four using Tandy boards. The TanPak includes a Serial Port, a Clock, and sockets for up to 512K of Memory Expansion. And the best part of all, it will save you some big bucks over the Tandy boards.

TanPak 128K \$399.

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Put a 10 Megabyte Hard Drive inside your Tandy 1000. This Hard drive subsystem includes an interface card and a Half-Height Hard Drive that directly replaces a floppy disk drive in both size and power consumption drive.

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A CURE FOR THE COMMON CODE

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ACT III can be purchased through this ad for \$399, and allows you to simulate the function of most any other educational courseware. It contains a full functioning word processor and lesson generator, a display program, a screen artist program for special graphics, a mini data based manager, a syntax checker and a menu generator, all fully integrated for fast, easy use.

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ACT III is available for the TRS-80 models III and IV. It comes with the program diskette and backup, data base diskette, tutorial and sample lesson diskette, 300 page user's manual in a stand-up binder, quick reference card, and all the support you need. You also get our 30 day, no-hassle, money back guarantee. Send for ACT III today!

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See our review in the April, '85, 80 Micro or send \$1.00
for our complete product information package.



Circle 186 on Reader Service card.

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- CHANGE NUMBER OF SEGMENTS
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- LITERAL INSERTION—specified fields
- COMPLETE USER MANUAL—with examples

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Profile, TRSDOS, are a registered trademark of Tandy Corp.

LDOS is a registered trademark of Logical System Inc.

PLEASE SPECIFY VERSION

NEW PRODUCTS



The Hard Drive Specialist Multiplexer for up to four computers.

and prints a sales slip.

Program options let you customize the program to suit your needs. For more information, contact APCA Systems, P.O. Box 978, Arbuckle, CA 95912, 916-476-3356.

Circle 564 on Reader Service card.

Channels of Communication

The Hard Drive Specialist Multiplexer (\$1,295) lets up to four Model I/III/4 computers access one hard disk system under LDOS, TRSDOS 6.X, DOS-PLUS 3.5, or DOSPLUS 4.0.

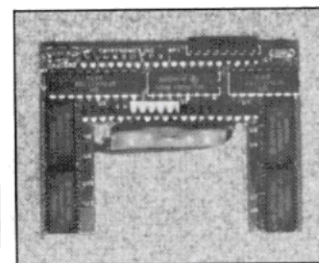
The multiplexer includes two host adapters and 40 feet of cable. Additional cabling and host adapters are available.

Contact Hard Drive Specialist, 16208 Hickory Knoll, Houston, TX 77059, 800-231-6671 for more details.

Circle 555 on Reader Service card.

RAM Expander

Cryptonics Inc. offers an internal expansion board that adds up to 64K to the Model 100's RAM. The 32K CMOS static RAM chips plug into the Model 100's expansion bus



Plug-in CMOS chips expand Model 100 RAM to 96K.

and leave the adjacent ROM socket accessible.

You can connect a disk/video interface to the expansion bus without removing the board. The unit includes a battery. The 64K board is \$425, 32K is \$275, and a 32K upgrade is \$200.

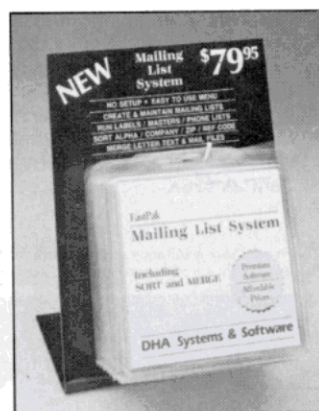
Contact Cryptonics Inc. (11711 Coley Circle, Suite 7, Fountain Valley, CA 92708, 714-540-1174) for more information.

Circle 557 on Reader Service card.

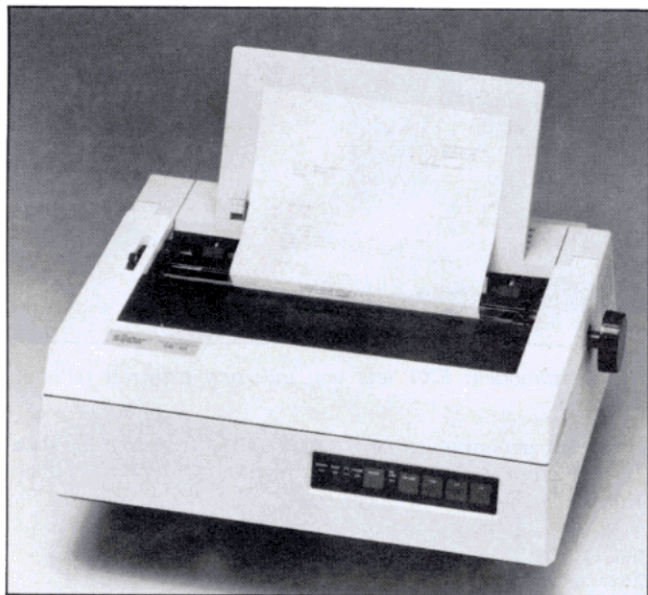
Mail Management Made Easy

The Mailing List Software System from DHA Systems and Software (832 Jury Court, San Jose, CA 95112, 408-947-1011) sorts, selects, and merges files to create personalized form letters on MS-DOS and CPM 80 systems.

You can print mailing labels, master lists, or phone lists. The Mailing List sorts alpha-



Mailings made easy on the Model 1000 or 1200.



The Star SB-10 features high-resolution graphics in text.

betically by last name, company, zip code, or reference code. The program also includes a utility to eliminate duplicate names. Price is \$79.95 plus \$5 shipping.

Circle 556 on Reader Service card.

Printer Deluxe

Star Micronics' top-of-the-line SB-10 dot-matrix printer (\$949) produces high-resolution graphics or text. The unit prints text at 60 or 144 characters per second and easily combines graphics and text.

The SB-10 uses a 24-wire print head and features reversible paper feed, friction and tractor feed, and a one-line memory buffer (expandable to 128K). It comes with a one-year warranty.

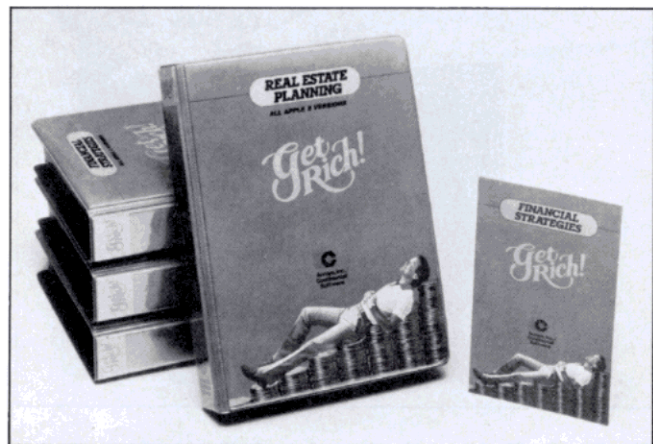
Contact Star Micronics Inc. (200 Park Ave., New York, NY 10166) for more information.

Circle 561 on Reader Service card.

Computing for Dollars

Get Rich: Strategies is the first in a series of personal financial planning programs for MS-DOS computers from Arrays Inc./Continental Software (11223 S. Hindry Ave., Los Angeles, CA 90045, 213-410-3977).

The program teaches basic money management skills, and tailors financial plans to individual needs. It uses worksheets for setting goals and determining net worth, calculations for solving monetary problems, and graphs for an-



Computerized finance strategies for the 1980s.



MULTIDOS 80/64 - FOR THE MODEL 4

New for your Model 4...A completely unique DOS...Not a rehash of TRSDOS 6...Not just another Model III DOS...A totally redesigned operating system for your Model 4.

- flip between 64 and 80 characters on the screen; 32 and 40 character widths also available
- runs Model III software
- use your extra 64K memory as a MEMDISK; automatically sets up MEMDISK as system disk, allowing use of the 0 drive for a data disk
- for 4P owners, never load MODELIII/A file again!
- disk I/O code written for Model 4; get fewer errors than you get using a Model III DOS
- a much faster BASIC; many enhancements and debugging tools
- over 41000 free bytes of memory in BASIC
- runs BASIC programs written for the Model III in 64 characters, or easily modified to 80 characters
- write programs using 80 character screen, function keys, and extra memory
- keyboard returns an extended character set; user controllable
- includes all the new features in 1.7 MULTIDOS

MULTIDOS 80/64 reads many disk formats, including all Model I/III DOS' and TRSDOS 6. If you're a Model III owner thinking about upgrading, this makes the transition easy.

MULTIDOS 80/64\$99.95

NEW VERSION MULTIDOS FOR MODEL I/III \$89.95

- includes a MEMDISK - set aside part of memory as a disk file
- for double-sided drives, select either one or two volume operation
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- all the great features of 1.6, including compatibility with all other DOS', plus many enhancements

ZEUS EDITOR/ASSEMBLER

- supports undocumented Z80 op codes and standard pseudo-ops
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- doesn't hog memory - lots of room for source code
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- "pages" the screen backward & forward for easy editing
- reads and writes files in ASCII, EDTASM, and Zeus compressed format
- Model 4 version supports 80x24 lines

ZEUS for Model I, III, 4, or MAX-80\$79.95

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Circle 384 on Reader Service card.

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When You Bought Your Computer, Did You Want It To:

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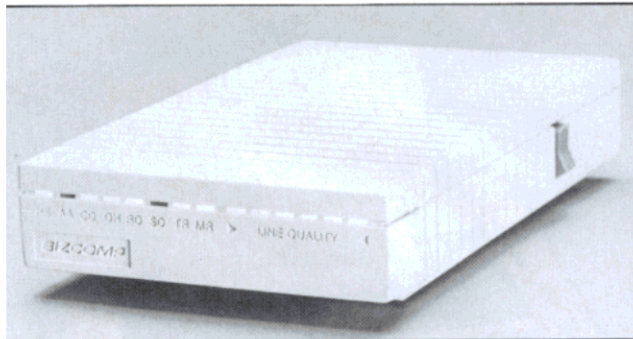
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NEW PRODUCTS



The Intellimodem EXT lets you talk and transmit without redialing.

alyzing investments over time.

Get Rich includes an instruction manual and a reference book on financial planning for \$49.95.

Circle 566 on Reader Service card.

switch between voice and data transmission without redialing. Cost is \$499.

Circle 563 on Reader Service card.

Oaken Accommodations

Think Modem

Bizcomp Corp. (532 Mercury Drive, Sunnyvale, CA 94086, 408-733-7800) has introduced the Intellimodem EXT 300/1,200-baud modem.

The unit is Hayes-compatible and features an LED bar graph display of line condition. Intellimodem senses a busy signal, dial tone, remote ringing, and voice. The EXT's Voice Insert capability lets you

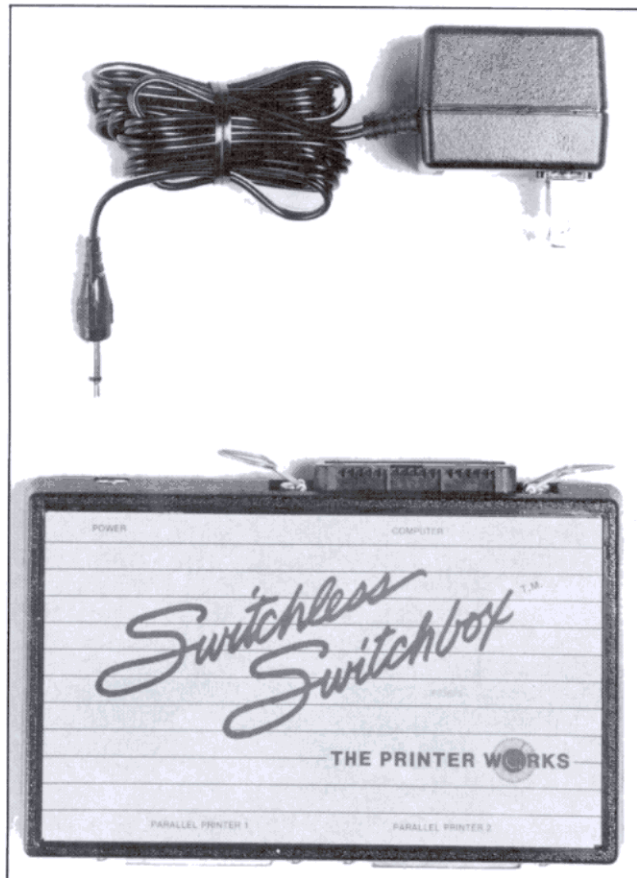
The Dayton Classic oak computer work station (\$449) provides computer storage space and a large desktop work area. The table top is 1-inch of solid oak measuring 48 by 30 inches.

The hutch (44 inches high by 12 inches deep) rests on the desk top and has compartments for a monitor, disks, and peripherals. Other features include a locking storage cabinet



The Dayton Classic work station has shelf space for your computer and peripherals.

NEW PRODUCTS



A switchless switchbox for tandem printing.

and angled foot rest. The pieces are also available separately.

For more information, contact Dayton Continental Corp., P.O. Box 1318, S. Bend, IN 46624.

Circle 565 on Reader Service card.

Switch Printing

The Model PS3625 Switchless Switchbox (\$119.95) lets you transmit data simultaneously to two printers. The unit attaches through the parallel port and automatically directs data to an activated printer.

Switchbox switches automatically, so you can tuck the unit out of sight behind your computer. An ac adapter plug is included.

For more information, contact The Printer Works, 1961 Alpine Way, Hayward, CA 94545, 415-887-6116.

Circle 567 on Reader Service card.

Granting Asylum

Asylum (\$39.95) is a three-dimensional high-resolution graphics adventure game for the Models 1000 and 1200.

Graphics are animated so you can roam the halls of Asylum to view events.

Asylum, short for Adventure Syndrome Leading to Ultimate Madness, pits you against guards, other inmates, puzzling objects, and gurus as you seek to prove your sanity. The program understands full sentences and is available from Screenplay Intelligent Statements Inc. (1095 Airport Road, Minden, NV 89243, 800-334-5470).

Circle 571 on Reader Service card.

Learning About Money

Money (\$39.95) is a Model I/III/4 program that drills children in monetary skills. Students choose from four lessons on pennies, nickels, dimes, quarters, half-dollars, and dollars.

The program randomly generates problems and gives positive reinforcement for correct answers. It displays correct answers after three tries. Once students score a certain per-

Circle 282 on Reader Service card.

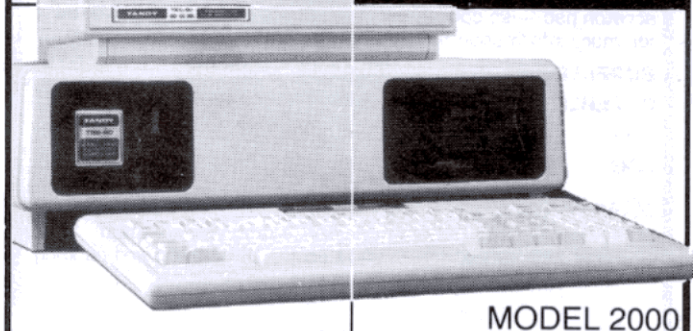
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MODEL 4-P

MODEL 1200

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A LOG or SUPERLOG Electronic Notebook is designed to replace your diary, address book, memo pad, card file, calendar, and scratch pad — so conveniently you will use it all day long. Call today for more information or immediate shipment.

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SUPERLOG 3	for I, III, 4 and 4P	LDOS 5.1	\$119.95
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LOG	for Model III	TRSDOS 1.3	\$ 49.95

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(TRSDOS is a trademark of Tandy Corporation)
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- ★ This is a flexible, easy-to-learn and easy-to-use program that can aid everyone from novices to advanced typists.

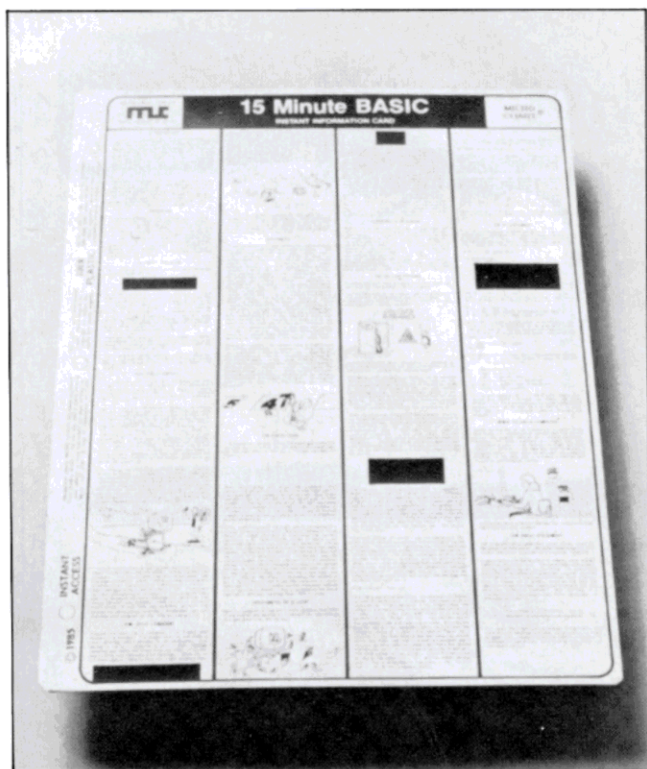
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NEW PRODUCTS



Learn Basic with a flash of this card.

centage correct, they can play an arcade game.

The program also includes a student management system that tracks scores of up to 200 students. Money is available with a back-up disk for \$54.95.

For more information, contact Gamco Industries Inc., Box 1911, Big Spring, TX 79721.

Circle 569 on Reader Service card.

Get It PFS:Right

The Complete PFS:Book, from Wordware Publishing Inc. (1104 Summit Ave., Plano, TX 75074, 214-423-0090) is an illustrated instruction book on using and integrating PFS:File, Report, Graph, Write, Proof, and Access.

Commands appear alphabetically, and subjects are arranged in short modules for easy comprehension. The book includes practical examples and illustrations, and is \$19.95 in softcover.

Circle 573 on Reader Service card.

Basic Basics

Micro Logic Corp.'s Micro Chart #12, 15-Minute Basic, is a quick way to write Basic programs. Designed for new programmers, the two-sided, col-

ored plastic card uses simple language and illustrations to get you programming.

The card covers statements, variables, formulas, strings, arrays, functions, and includes program examples. Micro Chart #4, Algorithms, is available for more advanced Basic programmers.

Charts are \$5.95 each plus \$1 postage from Micro Logic Corp., Dept. P, P.O. Box 174, Hackensack, NJ 07602, 201-342-6518.

Circle 568 on Reader Service card.

Remote Possibilities

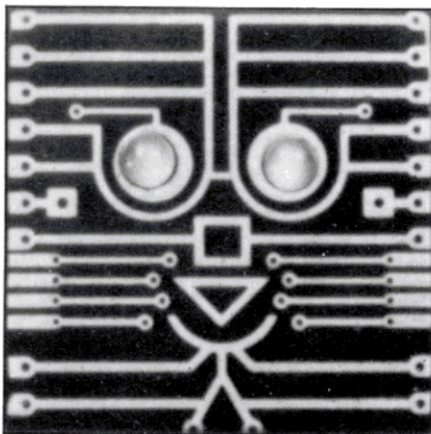
Analytical Comparisons Among Means: The First Degree (ANCOM/TFD, \$99.95) performs commonly overlooked statistical tests on the Models I, II, III, 4, 12, 16, 1000, 1200, and 2000.

Tests include planned and post-hoc contrasts, trend analyses, simple effects analyses, and several multiple comparison tests. The package also performs analyses of variance on complete and incomplete factorial designs.

Contact Scilab Inc., Box 614, Bunderland, NY 12084, 518-355-3363 for more information. Circle 575 on Reader Service card.

NEW PRODUCTS

DIFFERENT TRACK



Finally, a computer that won't bite.

The Computer Friend

Building a friendship with a computer is easy with Winkle, a \$4.99 computer chip with a gold circuitry face and LED eyes that blink. You can wear Winkle as a pin or earring. Ask him a question and his red and green eyes flash.

By touching different parts of the chip, you can make Winkle flash green or red. Winkle is 1 inch square and comes with a user's guide that includes a biography and instructions for basic chip care.

For more information, contact Xtronix Corp. at 540 Howard St., San Francisco, CA 94105, 415-777-1419.

Circle 560 on Reader Service card.

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573	WordWare Publishing Inc.	124
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SYSTEM FEATURES

- For TRS-80 Model 3-4-4P
- One Year Parts & Labor Warranty
- Size Rated After Format
- Continuous Duty Power Supply
- Error Checking & Correcting
- Continuous Duty Fan
- Size 11.5" x 12.5" x 5.0"
- All Contacts Gold Plated

*Model 3 requires LDOS

Model 4 requires TRSDOS 6.2 or Montezuma Micro CP/M 2.2

There are firms which offer benefits, experience or products seemingly too good to be true. Now why would you want to expose yourself to unhappiness when Aerocomp has a proven record of thousands of happy, satisfied TRS-80 customers. Just take a minute to look through back issues of this magazine. You won't find many companies that have been around as long as Aerocomp. We fully support TRS-80 computers and most all operating systems including CP/M 2.2. Aerocomp leads the way to low hard disk prices so you can afford to enjoy the benefits of increased storage and faster disk I/O. These units are precision engineered, tested and delivered complete and ready to use, right from our stock. Each unit is guaranteed for one year parts and labor. You can count on us to be here if you should ever need us. As always, your satisfaction is assured with our 14 day free trial offer. If, for some reason, you are dissatisfied with our drive merely return it for a full refund (less shipping). How can you go wrong? Specify the software driver of your choice and start enjoying your computer's real capability. Do it today! Call our toll-free number now!

See opposite page ▶▶▶▶▶

MODEL I DOUBLE DENSITY BOARD

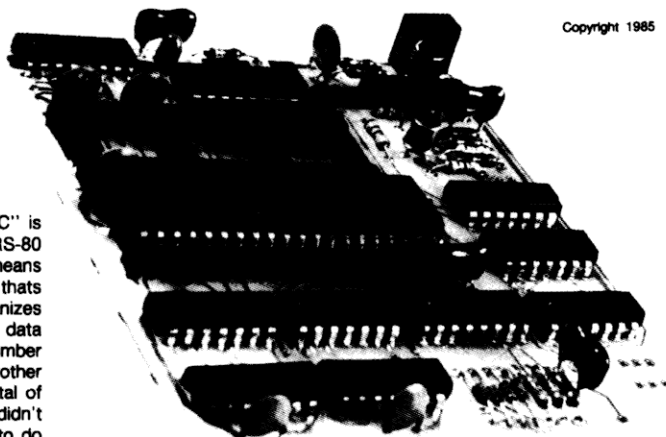
**Add 80% more capacity to your disk
system with the Double Density
Controller (DDC) from Aerocomp.**

The Story

Some products have what it takes to seem to last forever. Our "DDC" is one of those products. What it does is allow you to operate your TRS-80 Model I disk system in double density. In this case double density means almost doubling the storage capacity of your diskettes. Single density, that's the way Radio Shack designed your Model I expansion interface, organizes your disk into 10 sectors per track. Each sector contains 256 bytes of data for a total storage capacity of 2,560 bytes or 2.5K per track times the number of tracks your drive is capable of addressing. Double density, on the other hand, writes 18 sectors per track each containing 256 bytes for a total of 4,608 bytes or 4.5K. That is 80% more data in the same space. Why didn't Radio Shack do that in the beginning, you ask? Well it costs money to do double density because it is more difficult to do than single density and the data is harder to capture reliably. That means more cost and the Model I was meant to be a low-cost computer for the masses. Therefore, no double density for the original Model I.

The Facts

Other companies introduced double density controllers for the Model I but they were not so good. We waited and waited but, even new models failed to correct problems with data separation that kept cropping up. So we went to work and came up with a new design to cure the old problem. At last! A double density controller for the Model I with a higher probability of data recovery than with any other double density controller on the market then or since. Our analog design phase lock loop data separator has a wider capture window than the digital types the others use. This allows high resolution data centering. Our "DDC" analog circuit allows infinitely variable tuning. The attack and settling times are optimum for 5.25" diskettes. The oft-stated fears of adjustment problems rumored by digital dilettantes have been proved groundless by thousands of satisfied users the world over. The bottom line here is state-of-the-art performance and reliability.



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ORDER YOURS TODAY

TRS-80 Model I disk system owners who are ready for reliable double density operation will get 80% more storage per diskette; single and double density data separation with far fewer disk I/O errors; single density compatibility; simple plug-in operation. You will need a disk operating system that has the necessary double density software. All the popular DOS's (except TRSDOS) have the drivers. We have put together two special packages in the event you don't already have one of the more popular DOS's.

Please add \$4 handling & shipping

"DDC" by itself.....	\$ 99
"DDC" and LDOS.....	159
"DDC" and NEWDOS 80 2.0	179

- ☞ 40 Track
- ☞ 80 Track
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- ☞ Bare
- ☞ Complete
- ☞ Full Size
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Aerocomp leads the way to the BEST value in disk drives and related peripheral products on the market today. Sound engineering, high performance, quality construction, no-risk free trial, outstanding warranty service and a reputation for doing the right thing make your decision to buy Aerocomp the correct one. Please look over our offerings and make your selection. When you have made your choice call our toll-free number and place your order. If you need assistance in making your selection, please call our information number. It's listed in the box at the bottom of this ad along with the technical assistance number for those of you who want to get right to the nitty-gritty. Thanks, we all appreciate your business and will continue to do our very best to support you.

BARE DRIVES Add \$4 S&H

These drives are completely burned-in and tested for your ultimate satisfaction. Add that extra drive today! These are new factory drives. No blms, seconds or closeouts. Instruction manual included at no extra cost. Service manuals are available. See "Miscellaneous Goodies" for info.

40tk SS full size Tandon TM100-1	\$129
40tk DS full size Tandon TM100-2	169
40tk SS half high TEAC FD55-A	129
40tk DS half high TEAC FD55-B	169
80tk DS full size Tandon TM101-4	289
80tk DS half high TEAC FD55-F	239
8" SS Thinline Tandon TM848-1E	260
8" DS Thinline Tandon TM848-2E	335

8" FLOPPY DRIVES Add \$12 S&H

These 8" Thinline drives work with the Model 2 and 16 plus others that use standard drives. The rugged all-steel cabinet has an extra heavy duty power supply rated for continuous operation. A removable air filter allows only clean air to circulate. Cabinets with single drives are supplied with a blank panel to cover the unused space. A second drive can be added at any time. Service manuals are available. See "Miscellaneous Goodies" for info.

1-8" SS Tandon TM848-1E & case	\$389
2-8" SS Tandon TM848-1E's & case	649
1-8" DS Tandon TM848-1E & case	439
2-8" DS Tandon TM848-2E's & case	699

MISCELLANEOUS GOODIES \$2 S&H

Model 1 TRSDOS 2.3 disk & manual	\$25
Model 3 TRSDOS 1.3 disk & manual	25
Model 4 TRSDOS 6.2.x disk & manual	20
LDOS (specify Model I or II)	69
NEWDOS 80 v2.0 (specify Model I or II)	99
Montezuma Micro Model 4 CP/M 2.2	169
Tandon TM100-1/2 Service Manual	20
Tandon TM848-1/2 Service Manual	20
TEAC FD55A/B/F Service Manual	20
10 SSDD disks in library box, Lifetime Guar	16
10 DSDD disks in library box, Lifetime Guar	19
5.25" drive power supply & enclosure	59
8" drive pwr sply & encl w/fan 5V-24V	150
5.25" 1-drive cable, a nice length	19
5.25" 2-drive cable, a 44 inch	24
5.25" 3-drive cable, just the right size	29
5.25" 4-drive cable, the top dog	34
5.25" Extender cable with gold contacts	10

COMPLETE DRIVES Add \$6 S&H

Fits TRS-80 Models 1,3,4 and the Color Computer plus the others that use standard drives. The drive of your choice is mounted in a sturdy, all-steel cabinet. An external gold plated drive connector allows cabling without disassembly of the cabinet. Half-high drives come in a full-size cabinet that will hold and power our half-high drives. Single drives have a panel covering the unused space allowing a second drive to be added at any time. All are shipped fully assembled ready to use. Specify silver or white enclosure.

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40tk Double Side full size (TM100-2)	199
80tk DS full size (TM101-4)	299
1-40tk SS half-high FD-55A in dual case	169
2-40tk SS half-high FD-55A's in dual case	319
1-40tk DS half-high FD-55B in dual case	199
2-40tk DS half-high FD-55B's in dual case	359
1-80tk DS half-high FD-55F in dual case	219
2-80tk DS half-high FD-55F's in dual case	389

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Use your Aerocomp hardware product for up to 14 days. If you are not satisfied for ANY REASON (except misuse, damage or improper handling), return it (insured) in the original shipping container for a full purchase price refund, less shipping. Sorry, this offer does not apply to software. Defective software will be replaced. Any hardware/software specials will be prorated and the software will be charged at the regular unbundled price. We have confidence in our products and we know you will be satisfied.

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We offer a one year warranty on parts and labor against defects in materials and workmanship. In the event service becomes necessary for any reason you will find our service department fast, friendly and cooperative. We want to keep you happy. Out of warranty repairs are also available.

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Call our toll-free number service and place your order. Have your American Express, Mastercharge or Visa number ready. We will not charge your card until the day we ship your order. You may order by mail using your credit card, check or money order. Personal and company checks are welcome and cause no shipping delay as long as they are bank printed and the signature exactly agrees with the name printed on the check. We will ship surface COD with no deposit but all COD's require cash or a cashier's check on delivery. Texas residents add 6% State Sales Tax. No tax collected on out of state shipments. Canadian addresses add \$20 to your order if over \$550 for customs documentation.

TRS-80 Model III & 4 DISK CONTROLLER and DRIVE KITS

Convert your cassette Model III or 4 to disk operation with one of our complete kits. You receive our own advanced disk controller board with gold plated edge contacts capable of 4-drive operation; our own power supply; plated steel mounting towers complete with RFI shield plus all the cables and hardware necessary. Detailed instructions are included. All you need is a screwdriver and a pair of pliers. System kits come with 40 track single-side drives or just order the basic kit and pick the drives you want from the selection in the next column.

CONTROLLER KIT\$199

(Everything you need - less drives/DOS)

1 DRIVE SYSTEM.....319

2 DRIVE SYSTEM.....439

Add \$6 S&H

MOUNTING KIT & POWER SUPPLY.....95

Add \$8 S&H

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OUR FAMOUS MODEL I STARTER PACKAGE

If you have a Model I and an Expansion Interface this is what you need to get started with disks. Included is one 40 track single-side disk drive complete with matching silver case and power supply, a 2-drive cable, a TRSDOS 2.3 disk operating system and TRSDOS manual plus all insurance and delivery charges to your door (lower 48 states).

Yours for only **\$199**

You can add our renown "DDC" double density controller to either the Radio Shack or the LNW Expansion Interface for 80% more storage capacity on your drive. Order it at the same time as our starter package above and we'll pay the shipping. Go ahead, you deserve increased density. See the opposite page for the latest technical details.

\$99

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Why Tandy Goes Undercovered

Send your questions dealing specifically with Tandy policies, products, or services, to Ask Tandy, 80 Micro, 80 Pine St., Peterborough, NH 03458. A representative at Tandy's Fort Worth, TX, headquarters supplies all responses published here.

Q: To read 80 Micro, you'd think Radio Shack computer owners really exist. But the business press rarely mentions Tandy computers. Why?

A: We suspect a couple of factors. First, Tandy doesn't participate in the "great war for shelf space," and several journalists have told me that's what makes news. Tandy sells its products through its own stores.

Second, we've had "Radio Shack" on our computers, and that's the name of a retailer. We believe some publications felt that by talking about Radio Shack computers, they were giving a retail chain free publicity. The Tandy brand name should eliminate that problem.

At any rate, we're getting quite a lot of coverage lately in the trade press, compared to what we got a year or two ago. We think the situation's getting better.

Q: Why don't you produce a 64K dual-drive Model 4 in a Model 4P configuration, with the 4P's detached keyboard and the 4's 12-inch screen?

A: The Model 4 doesn't have a detached keyboard for two reasons. First, Model 1 owners wanted us to "put it all in one box and get rid of all the cables." Second, schools are big Model 4 customers, and they prefer attached keyboards that can't wander off.

A 12-inch screen would compromise the 4P's transportability. We just don't think a hybrid Model 4 would have wide enough appeal.

Q: The Tandy 1000 is a nice product, but it seems to be an extravagant PCjr. The jr is also PC-compatible, but it's less expensive than the 1000. Do the 1000's extra features merit a higher price? How compatible is the Tandy 1000 with the jr?

A: The Tandy 1000 was designed to run PC software. At the same time, Tandy made every attempt to make it jr-compatible, too. I wouldn't call the 1000 an extravagant jr at all; I might say it's what the jr should have been. The jr's memory is limited to 512K; the 1000 expands to 640K. The 1000 uses PC-compatible expansion cards up to 10 inches long. The jr runs at half the speed of the PC and lacks a direct memory access chip (for faster processing), which the 1000 acquires with expansion to 256K.

The bottom line is that the Tandy 1000 is a business machine, which, because of its low price, is also practical for home use. The price seems to cause people to compare the 1000 to a jr, but it's really a full PC-compatible unit.

Q: I own a Model 4, and I hate having the @ key function as a control key. When I try to type the letter "P," I'm always hitting both the @ and P keys, which puts me in print mode. Couldn't you put a stronger spring under the @ key to prevent accidentally invoking a command? Sounds like a simple and inexpensive hardware solution to me.

A: You're right, the Model 4's keyboard probably doesn't have the world's best layout. We had to keep the @ key active as a control key to maintain software compatibility with the Model III in some cases. We inherited that problem from the Model I, in fact. I don't know whether we can install a stiffer spring, but I'll pass your suggestion on to the product manager.

Q: It seems to me that bar codes would be an ideal way to distribute programs. Your Models 100 and 200 have bar code reading capability, and one magazine prints program listings in bar code. I just bought a Tandy 1000, and I'd like to be able to use bar codes. Will Tandy produce a bar code reader for the 1000?

A: Program listings in current bar code formats take a tremendous amount of space. And the listings' print quality is critical; I've tried downloading with less than 100 percent success.

But you're right; it's an interesting way to format listings. And if you have a graphics-capable printer, you could list your programs in bar code format and reload them with a wand. We're considering a bar code system for computers other than the 100/200, but we've reached no decision. Thanks for the input.

Q: I have a Model III that I've intended to upgrade to a Model 4. Now that you've made lots of changes in the line and lowered the 4/4P's price, why haven't you lowered the conversion cost for me? It would cost me more than \$1,540 with installation.

A: Unfortunately, even though we have lowered the prices of upgrade kits, their combined cost is still more than that of a new Model 4. The \$799 III/4 upgrade assumes you already have a disk-based Model III. It upgrades everything but your drive, cabinet, and monitor. There's a new power supply, for example. (However, we have to furnish another power supply with the cassette-to-disk kit.) It's these duplications that make the upgrade path you're considering very expensive. The kits have to cover the most requested upgrades. We just can't economically cover every possible combination.

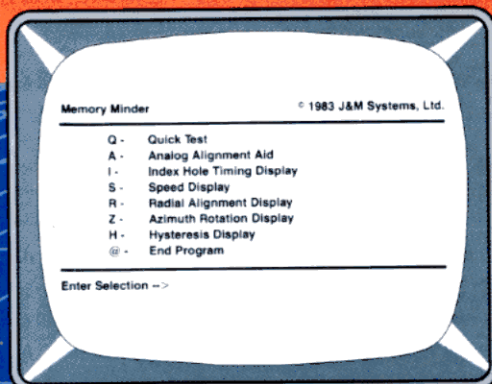
Q: I've experienced long delays when ordering products through my Computer Center. I read somewhere that when a salesperson orders an item from Fort Worth in the customer's name, Tandy fills the order quicker than when the order is in the store's name. Is this true?

A: I think you're confusing two classes of merchandise. Tandy lets stores stock only certain products. We ship stockable merchandise to stores at specific intervals. So, if you place an order just after one shipment goes out, you'll have to wait until we ship the next batch.

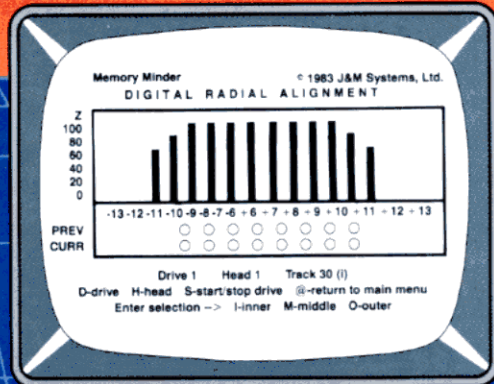
On the other hand, if a store orders an unstockable item for a customer, we ship it within 24 hours of the order's reaching Fort Worth. That's the difference. ■

MEMORY MINDER^{T.M.}

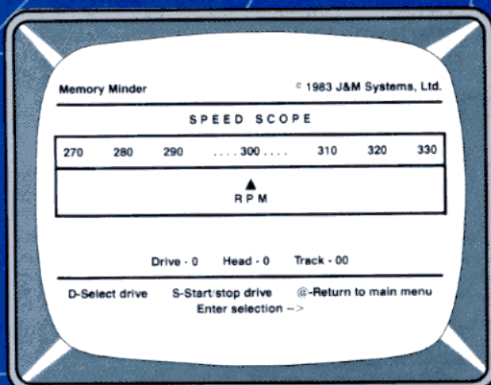
... A UNIQUE APPROACH TO DISK RELIABILITY!



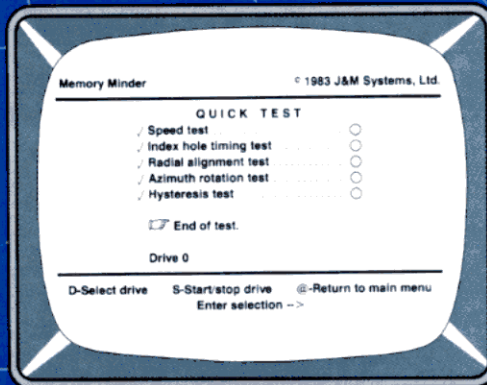
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Use the MM Radial Alignment Test to check the head alignment of your drives. No need for an oscilloscope or other expensive test equipment!



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Spot problems *before* they endanger your data! If you own a disk drive, you *need* the **Memory Minder**!

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Includes 48 tpi & 96 tpi program diskettes	
TRS-80 Model -I	
1 - 48 tpi Single Side Single Density	\$89
TRS-80 Color Computer and TDP-100	
1 - 48 tpi Single Side (Standard)	\$79
2 - 48 tpi Double Side	\$99

MM also available for other models

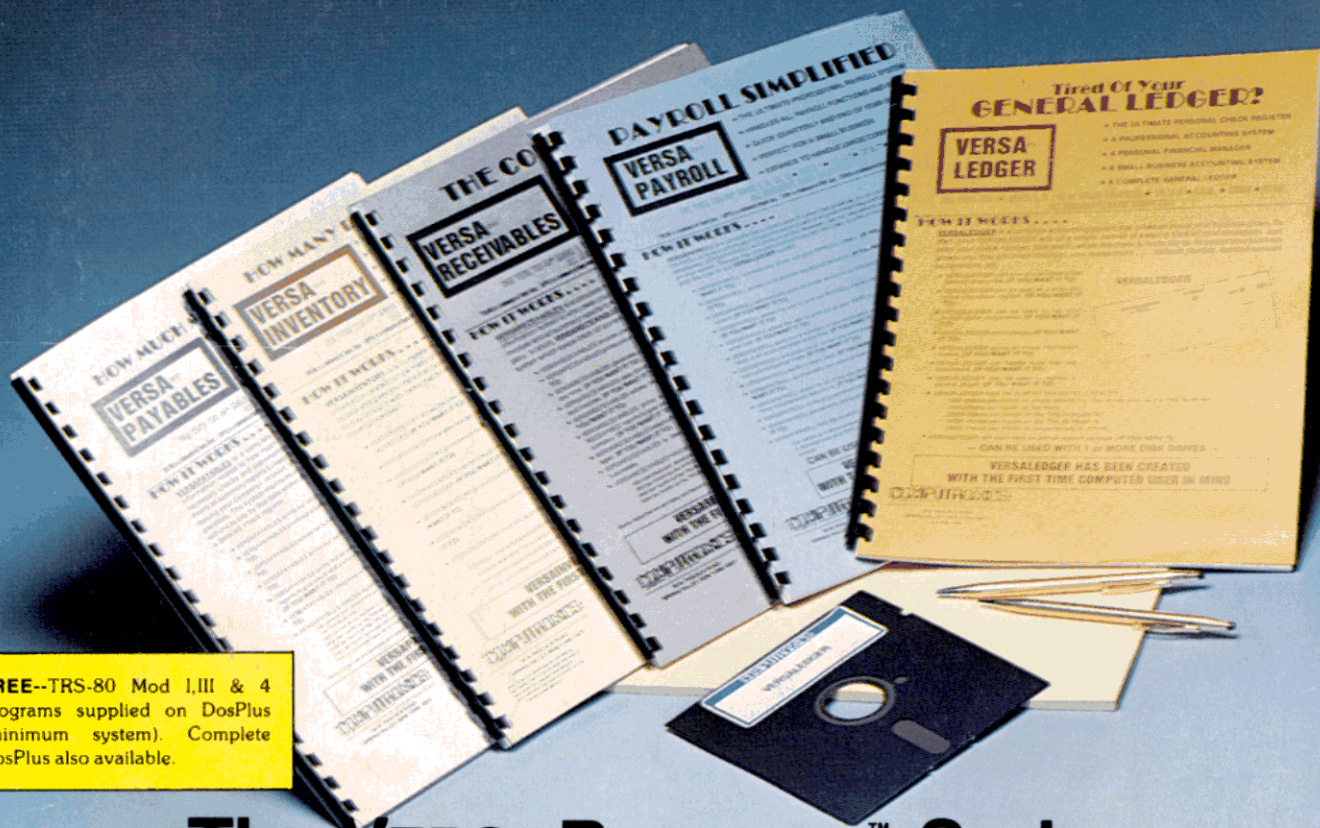
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